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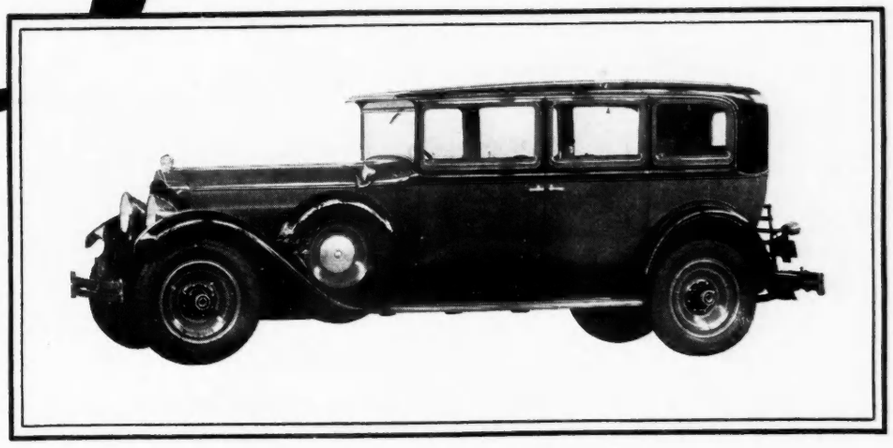

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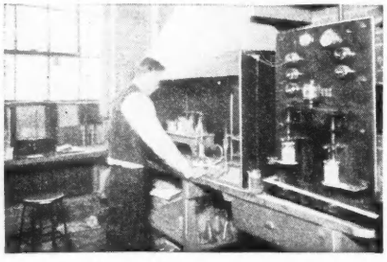
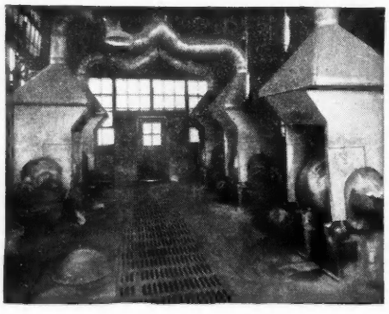


A corner of the Federal-Mogul laboratory, where a constant search is conducted for possible improvements in Federal-Mogul quality.



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The AUTOMOBILE

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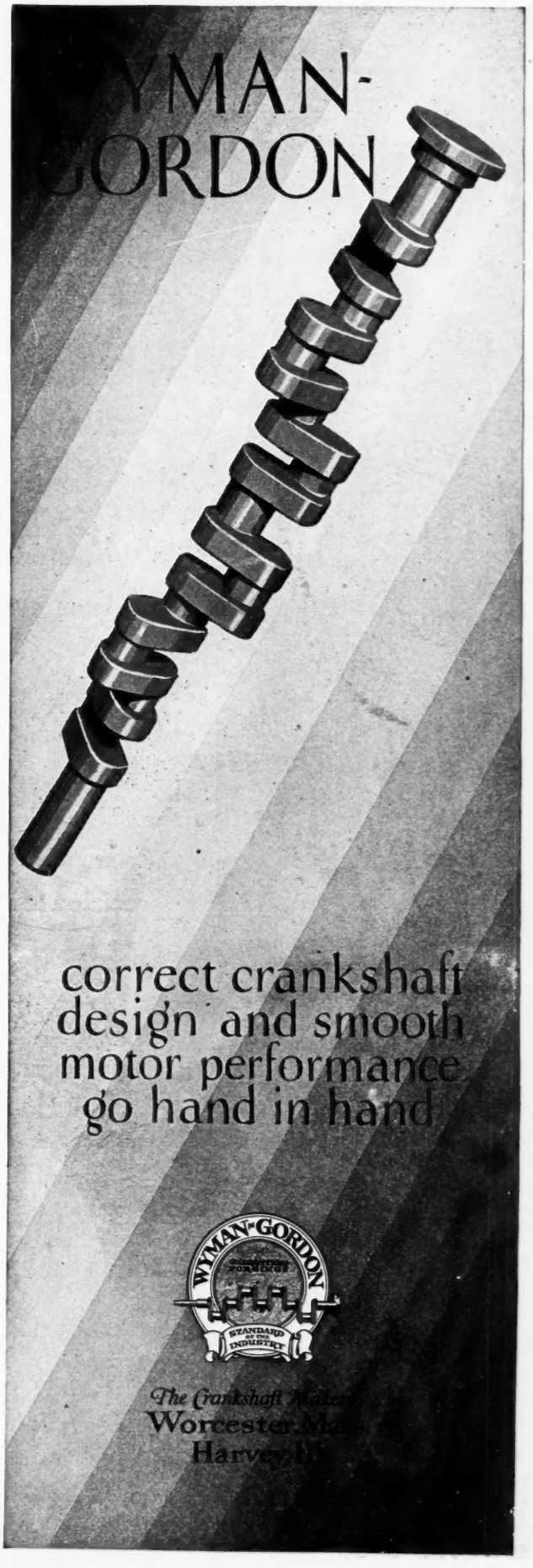

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AUTOMOTIVE INDUSTRIES
VOLUME 60 *Philadelphia, Saturday, April 6, 1929* NUMBER 14

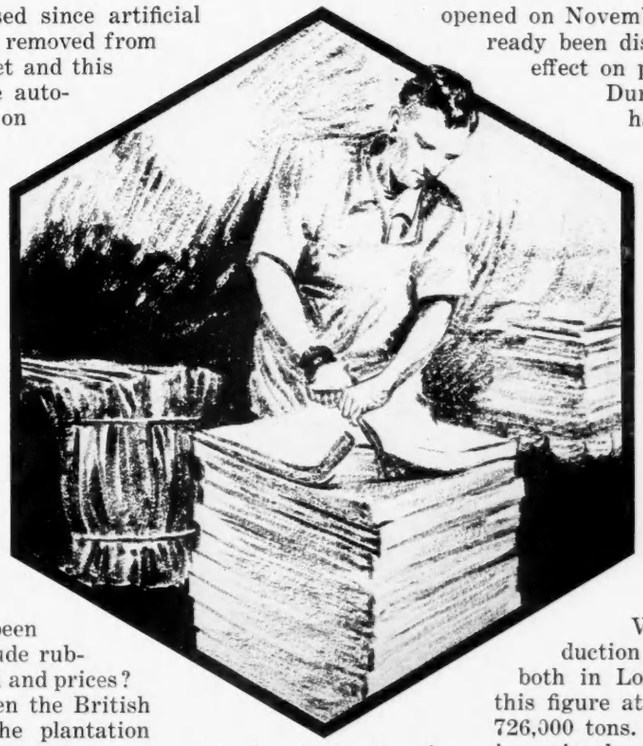
Marked Rise in *Rubber* Prices *Unlikely* During 1929

Production this year estimated between 692,000 and 726,000 tons. Consumption probably about 725,000 tons. Many hindrances to accurate future predictions.

By A. B. Crofoot

JUST one year has passed since artificial restraint was, in effect, removed from the crude rubber market and this commodity, essential to the automotive industry, was put on a basis of natural reaction to the economic laws of supply and demand.

It was on April 4, 1928, that the British government announced that restriction of crude rubber exports from her colonies would be abandoned. This abandonment did not go into effect until November 1 of last year, but knowledge that the restrictive measures were shortly to become inoperative had much the same effect on the market as if the abandonment had already taken place. What has been the consequent effect on crude rubber production, consumption and prices?



Tearing sheets of crude rubber from bales

During the six years when the British government was telling the plantation growers in Malaya and Ceylon what portion of their potential crude rubber production they could harvest and export, prices had shown a fairly wide fluctuation, finally settling, however, to a comparatively steady level at around 40 cents a pound in the New York market.

In February of last year the possibility that restriction might be removed became common knowledge. Prices immediately began receding, with the result that when the final announcement came rubber had descended to around 20 cents a pound and shortly thereafter went as low in some positions as 17 cents a pound. The result of all this was that when the gates were finally opened on November 1 the situation had already been discounted and practically no effect on prices was shown.

During the next two and one-half or three months prices remained fairly steady at a level around 20 cents. Toward the end of January prices began ascending and during March reached a level of about 26 to 28 cents a pound, from which they showed a slight recession during the third week of the month. These advancing prices were variously attributed to speculation in the London market and to the statistical position of crude rubber. A survey of the statistical angle, therefore, is interesting at this point.

Various estimates as to production during 1929 by brokers both in London and New York place this figure at anywhere from 692,000 to 726,000 tons. Consumption for the year is variously estimated through the narrower range of from 723,000 to 727,000 tons, indicating a possible excess of consumption over production. To offset this we had at the beginning of the year available stocks estimated at about 231,000 to 243,000 tons. Thus it would appear that there is an available supply actually on hand and in prospect for 1929 of anywhere from 923,000 to 969,000 tons, as against a probable consumption of somewhere in the neighborhood of 725,000 tons. Superficially, therefore, it might appear that there would be a slight diminution in world stocks by the end of this year which would justify the advancing prices.

As in the case of all natural products there are a number of factors affecting the situation which can never be entirely foreseen. The best way of arriving at any conclusion, therefore, is to study potential production and probable consumption in the light of past experience.

Consumption can be gaged with a fair degree of accuracy since it is known that the United States purchases about 70 per cent of the world's production of crude rubber. Of the amount purchased about 85 per cent is used in the automotive industry. Assuming that the generally accepted figure of 5,000,000 new vehicles produced this year is reasonably accurate, and estimating the replacements required on automobiles now on the road in the light of past experience, it is a comparatively easy matter to gage the amount of crude rubber which this industry will require during the year. From that point it is also a simple matter to estimate the total requirements of the world. This would account for the relatively narrow range already mentioned in the various estimates of consumption for 1929.

When it comes to production the matter is not so simple. In certain territories, particularly in Malaya, Ceylon and the Dutch East Indies, a large percentage of the crude rubber produced is grown on efficiently managed plantations and unless some unforeseen blight should occur the plantation production may be estimated with a fair degree of accuracy.

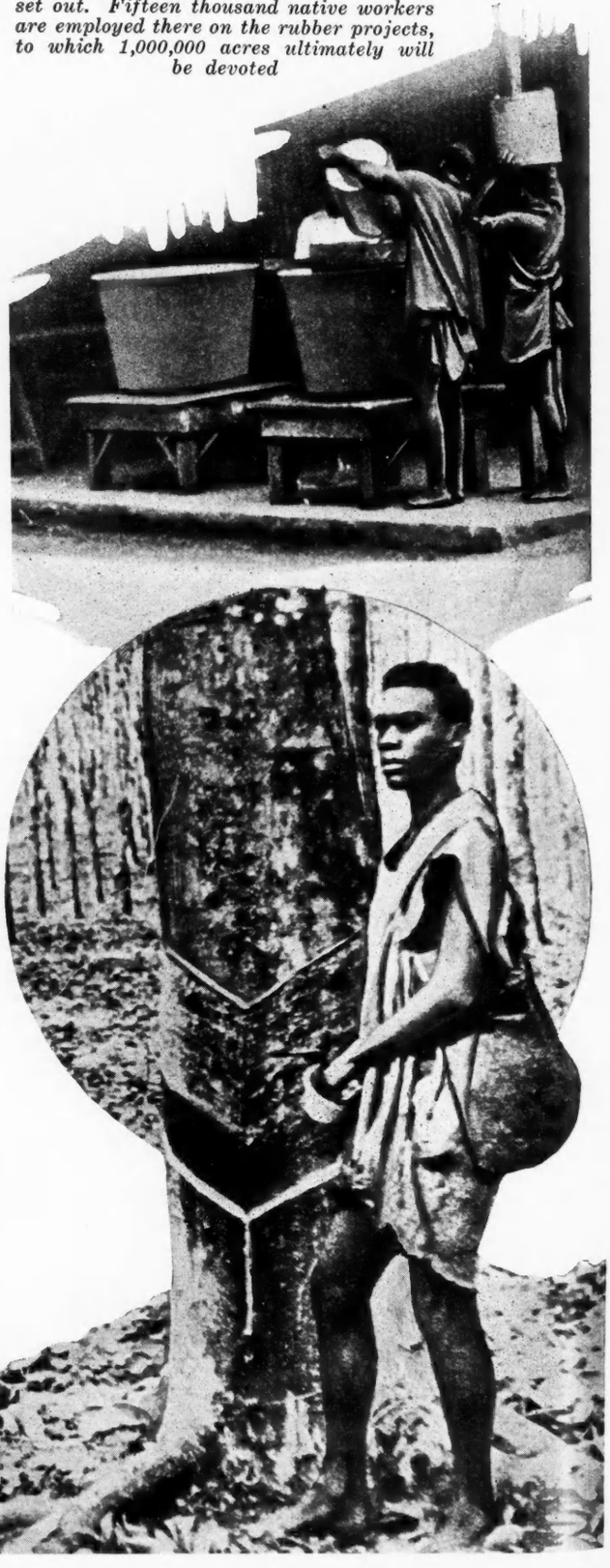
There are, however, in all the rubber growing sections stands of wild rubber and there are also trees planted and cared for by natives whose harvesting of the crop depends purely upon the incentive in the way of price. It is largely this so-called native rubber that introduces the element of uncertainty and holds the balance between feast and famine.

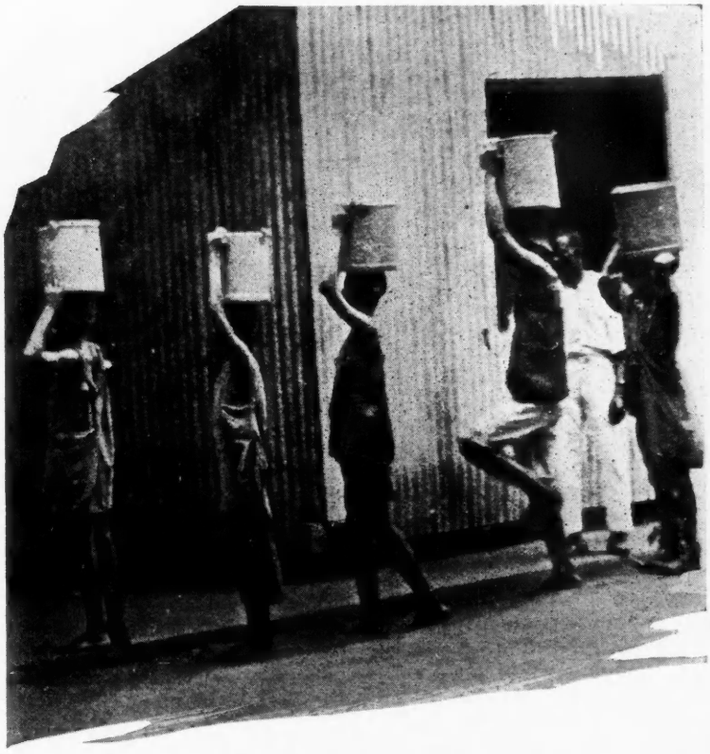
Prior to the removal of restriction in the British plantations this native rubber was augmented to a considerable extent by rubber smuggled from British territories into the Dutch East Indies and there sold as Dutch East Indian native rubber. It is obviously impossible to estimate what portion of the native rubber was smuggled from British territories and any figures on native production are, therefore, guesses at best.

Another aspect affecting the amount of native rubber available is that many of the natives do not concentrate on rubber but also grow rice and sago. These natives, of course, vary their activities in accordance with the incentive furnished by the prices of their various commodities. Under present price conditions it is quite possible that a number of these will neglect their rubber in favor of their other crops, but it must also be borne in mind that this native rubber is always a potential factor ready to be tapped the minute prices begin to go above a certain level. This native rubber can doubtless be counted on to keep prices of crude rubber within a fairly reasonable range barring sudden developments.

Let us view these figures for a moment in the light of past experience. A year ago the production was estimated at 560,000 tons with consumption estimated

The upper picture shows natives bringing in the rubber fluid (latex) and pouring it into containers at the factory. The picture below shows a native worker gatherig the rubber fluid (latex) on one of the Firestone Liberian plantations. Rubber trees must be five years old before they yield fluid. A record for rubber planting was achieved last year in Liberia on the west coast of Africa, where the Firestone organization is cultivating two 50,000-acre plantations, when 3,000,000 trees were set out. Fifteen thousand native workers are employed there on the rubber projects, to which 1,000,000 acres ultimately will be devoted





at 635,000 tons. This was before restriction had actually been removed. After restriction was removed production was re-estimated at 667,000 tons, roughly. Surplus carried over from the year before was 273,000 tons. Actual production for the year was 653,000 tons with actual consumption 684,000 tons, resulting in a depletion of world stock by about 30,000 tons, or making the stocks available at the beginning of this year about 243,000 tons.

Of course a certain portion of the increased consumption was brought about as a result of a much easier price situation following a larger supply made available by the removal of restriction. However, the situation the year before, when there seemed slight possibility of removing rubber restriction, resulted much the same, with world stocks reduced by 25,000 tons during the year. Whether consumption will exceed preliminary estimates this year, as it did during the past two years, of course is impossible to state. Even should this occur, however, there seems little likelihood that the world stock of 243,000 tons will be depleted to a point where prices much higher than current levels would be justified.

In view of the advancing tendency in prices during the past two months, it is interesting to note that during January the imports to this country were 57,564 tons as compared with 39,107 tons in January of last year. In February the imports were 64,538 tons as compared with 29,445 in February of last year. In other words, imports during the first two months of the current year were 122,102 tons as compared with 68,552 tons during a like period of 1928.

Consumption in January of this year was 43,002 tons, with consumption in February 41,500 tons, or a total consumption during the two months of 84,502 tons. This points to a rapid accumulation of stock in this country during the first two months of the year, much greater than would seem to justify the advance in prices unless that advance were purely speculative.

Another factor making toward uncertainty in estimates of production is the fact that since November 1 much rubber has been coming on the market which accumulated in the hands of plantation owners and dealers during the six months prior to the final removal of restriction. It is thought that not all of this accumulation will have come out until about the first of May, so that present import figures may be slightly misleading as an index of production for the year.

Early in March a rumor started to the effect that tire prices were to be advanced shortly. This rumor was immediately denied by James O. Tew, president of the Goodrich Tire & Rubber Co., and other manufacturers seemed to exhibit no haste in making any such changes as had been predicted. It would seem evident from this that the tire manufacturers are not convinced that crude rubber prices, at present at least, would justify them in asking their dealers a higher price for tires.

Some speculation was held a year ago as to the effect of lower crude rubber prices on the reclaimed rubber situation. At that time it was pointed out that there were approximately 47 tons of reclaimed rubber consumed for every 100 tons of crude rubber. Incidentally this figure should be explained as it has too often been interpreted to indicate that 47 per cent of the rubber consumed was reclaimed rubber. Just why the rubber industry should state its figures this way is hard to say, but it will be noted that the ratio of 47 tons reclaimed to 100 tons of crude means that reclaimed rubber constitutes only a little over 31 per cent of the total rubber used. It is noteworthy that the ratio of reclaimed rubber to crude rubber still remains about the same; that is, 47 tons reclaimed for every 100 tons of crude. This is interesting in view of the fact that it is claimed that it costs between 15 and 20 cents a pound to reclaim rubber. However, manufacturers who have established their formulae and set up their machinery for the use of reclaimed rubber find that it is still less expensive to use reclaimed rubber than it would be to make the necessary changes in their formulae and machinery.

With the steadily increasing production of crude rubber as indicated by existing estimates, and with the corresponding increase in the use of reclaimed rubber, it seems improbable that there should be any marked advance in the price of rubber during 1929 unless some new use should be developed. This statement is advanced in face of the fact that certain factors are predicting an advance to 30 cents for crude rubber for the year.

The high level reached in January by the nation's exports of rubber goods was surpassed in February when the total exports reached a value of $7,203,846, an increase of nearly 2 per cent over last January and 29 per cent over February, 1928, according to the rubber division of the Department of Commerce. February exports were exceeded only by the three months of July, September and November, 1920.

The advance made in February was due primarily to the large increase in automotive rubber goods, whose value amounted to $4,525,055, or 63 per cent of the total. All other items decreased in value as compared with January except semi-manufactured rubber, which increased 32 per cent.

Eleven countries took more than 10,000 automobile casing in February, Belgium leading with 37,581 units.

One-Ton Fargo Truck With Six-Going Into *Production*

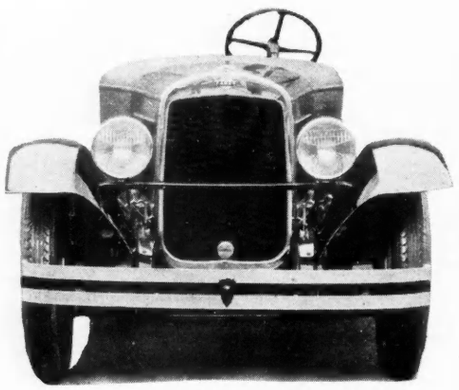
The vehicle is described as the first of a line of larger commercial units to be manufactured by the Chrysler subsidiary. The chassis price f.o.b. is $795.

WITH final details of construction settled, the new Fargo one-ton six-cylinder truck, the first of a line of larger trucks is being put into production, and deliveries to dealers will begin the latter part of April. In appearance as well as in design, the new truck has the earmarks of a deluxe unit, with Duco finish in four color options, large tires, gracefully rounded special bodies, four-wheel internal hydraulic brakes, four-speed special truck transmission with provision for power take-off, two-piece propeller shaft, heavy duty rear axle with cast steel housing, and sturdy frame.

The f.o.b. price for the one-ton chassis is $795. To achieve this low price without skimping, the Fargo Motor Corporation has taken advantage of the large scale Chrysler passenger car production by using here and there interchangeable parts adapted to truck use. This is particularly true of the engine, which, while modified to adapt it to truck use, carries most of the major parts of the De Soto six powerplant.

Of the engine modifications for truck use, there might be mentioned a new Stromberg carburetor of the plain tube type, new inlet manifolding, and a larger fan, fan shaft and fan belt. Major dimensions are given in the accompanying table. Attention should be called to the sturdy four-bearing 2¼-in. crankshaft, weighing 58 lb., and thus well suited to truck use. The savings effected by the conversion of this engine are further reflected by the large number of accessories it has been possible to include. Among these are an air cleaner, Purolator; gasoline filter, crankcase ventilation, thermostat, and manifold heat control. Interchangeability of parts also simplifies obtaining of service parts, means smaller parts stocks to be carried and permits lower parts prices.

Fuel feed is by vacuum tank system from a 15-gal. tank, whose installation is interesting. The tank is located under the seat, but so installed that its top is flush with the body floor boards, and thus enables full use to be made of the entire body length from the dash back, for the carrying of unusually long materials. In order to clear the propeller shaft with this low mounting, the bottom of the tank has been arched upwards in its center, and a double outlet, one from each side of the bottom of the tank, is provided. This double outlet, in addition to minimizing the chance of choking of the line, also serves as an equalizer for the gasoline level in the tank. The two outlets are joined at the right side in a T connection, a single pipe running from there to the vacuum tank. An electric dash gasoline gage is standard equipment.



Front view of the 1-ton Fargo truck, delivery of which is to begin the latter part of April

Lubrication of the throwout bearing for the 10-in., single-plate, multiple-spring clutch is by a grease cup on a tube running forwards into the engine compartment. As mentioned, the transmission is of special truck design and is an entirely new unit. It has four speeds forward using the standard S.A.E. shift, with a reverse latchout. The reverse position of the shift lever is to the right of high, or direct drive. All bearings of the transmission, with the exception of the reverse idler and pinion, are of the anti-friction type. The low-speed reduction is 6.5 to 1, providing an overall reduction of about 37 to 1. A power take-off can be installed on the right side. Spur gears are used throughout.

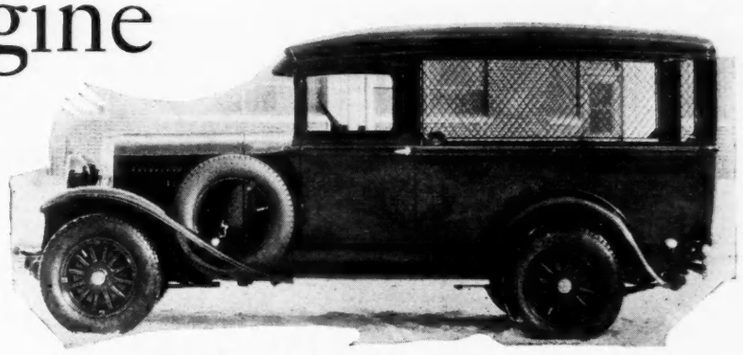
Connecting the transmission with the semi-floating rear axle is a two-piece propeller shaft, carried in three Universal Products universal joints. The center universal is carried by a self-aligning bearing in a bracket mounted on the pierced central frame cross-member, the shaft passing through this member.

The rear axle has a cast steel housing and axle shafts, which are 1 31/32 in. in diameter at the Timken double wheel bearings. Timken bearings are used also at the differential, while the pinion shaft is straddle-mounted in ball bearings. The standard final reduction is 5.67 to 1. A tread width of 59 in. at the rear permits of both a frame width and a spring center distance greater than usually employed, which tends to reduce side sway and thus increase the roadability of the vehicle.

There is a kick-up in the frame over the rear axle, but the projecting portion is straight and in line with the main portion. This assures a low frame and loading height, a feature further contributed to by the pierced center cross-member through which the propeller shaft passes. The frame itself has channels 6 in. deep of 5/32 in. stock, with

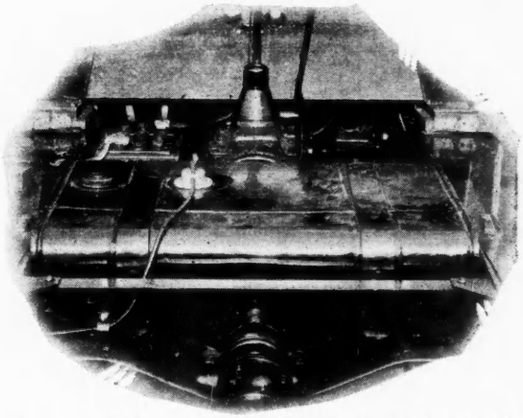
Cylinder Engine

By
Athel
F.
Denham



The screen delivery body on the new Fargo truck chassis

rather less taper toward the rear than usual. Cross-members are all of the channel type, and are gusseted. Rear engine mounts act as a further cross-member, being of the solid type. The front mounting is also of the metallic type, but the hold-down bolts below the front cross-member are spring-loaded to protect the engine in case of unusually large frame distortion.



The top of the 15-gal. fuel tank is level with the body floor boards

To avoid projection of shackles over the top of the side rail, where they might interfere with body mounting, and still obtain low frame height, with respect to axles, tension type metal shackles are used. Springs are semi-elliptic, 39 by 2 in. at the front and 51 by 2½ in. at the rear. Chassis lubrication is by Alemite connections.

A self-compensating, self-refilling master cylinder, with the gravity supply tank on the dash is used in connection with the four-wheel internal hydraulic brakes. The latter have 14 in. drums, 1¾ in. wide at the front, and 15 in. drums 2 in. wide at the rear, and they are supplemented by a parking brake on the propeller shaft just back of the transmission.

A feature worthy of mention is the method of working out the standard tire equipment. It was felt that 32 x 6 in. truck tires should be used on the rear wheels, but that this did not necessarily mean that equipment as expensive was needed on the front wheels. On the front wheels, 5.50/20 truck tires are used, but these mount on the same size rims as the rear tires, so that the operator, if he so desires, can purchase or substitute 32 by 6's all around. A 32 by 6 tire is furnished as a spare. In emergency, due to the above design, the spare can be used on a front wheel. The balloon tirs are marked "for front wheel use." Various tire and wheel options are available at additional cost.

Wheels are 20 in. in diameter, and of the wood-spoke type for standard equipment. Front axles are of I-beam center section, changing to a rectangular section at the knuckles. The steering gear is a Hannum worm-and-nut type, and is provided with a large, 19-in. steering wheel on which are mounted the light controls.

Bodies supplied by Fargo include a panel delivery, canopy express, screen delivery and sedan delivery. These bodies are all furnished with a special rounded cowl of the passenger-car type and de luxe cabs. The nominal body size is 8 ft., this being the length from the cab back. From the dash back the bodies are 148 in. long, with a length of 49 in. from the back of the cab to the center of the rear axle.

Fargo Specifications

Capacity	one ton
Engine	6 cylinder
Type	L-head
Bore and stroke	3⅛ by 4
Piston displacement	174.9 cu. in.
Maximum power	55 at 3000 r.p.m.
Compression ratio	5 to 1
Pistons	Aluminum-Invarstrut
Conn. rods, length	8 15/16 in.
Crankshaft diameter	2¼ in.
No. main bearings	Four
Valve head diameter	1 5/16 in.
Clutch	10 in. single plate
Transmission	4-speed
Low gear ratio	6.5 to 1
Propeller shaft	two-piece
Universals	Universal Products
Rear axle	Clark
Type	Semi-floating
Reduction	5.67 to 1
Tread	59 in.
Brakes	4-wheel internal
Type	Lockheed
Drum, front diam.	14
front width	1¾
rear diam.	15
rear width	2
Parking	Transmission
Wheels	Wood
Rims	20 in. truck
Tires, front	5.50/20
Tires, rear	32 by 6 in.
Steering gear	Hannum worm and nut
Front axle	Reverse Elliot
Spring, front, length	39 in.
front, width	2 in.
rear, length	51 in.
rear, width	2½ in.
Frame, channel depth	6 in.
stock	5/32 in.
Body Dimensions:	
Length back of cab	96 in.
Length back of dash	148 in.
Width at floor	45¼ in.
Width at belt	49 in.
Inside height	50 in.
Back of cab to rear axle center	49 in.
Wheelbase	133 in.

Austrian Daimler *Air-Cooled Engines Are in* Twos, Fours and Eights

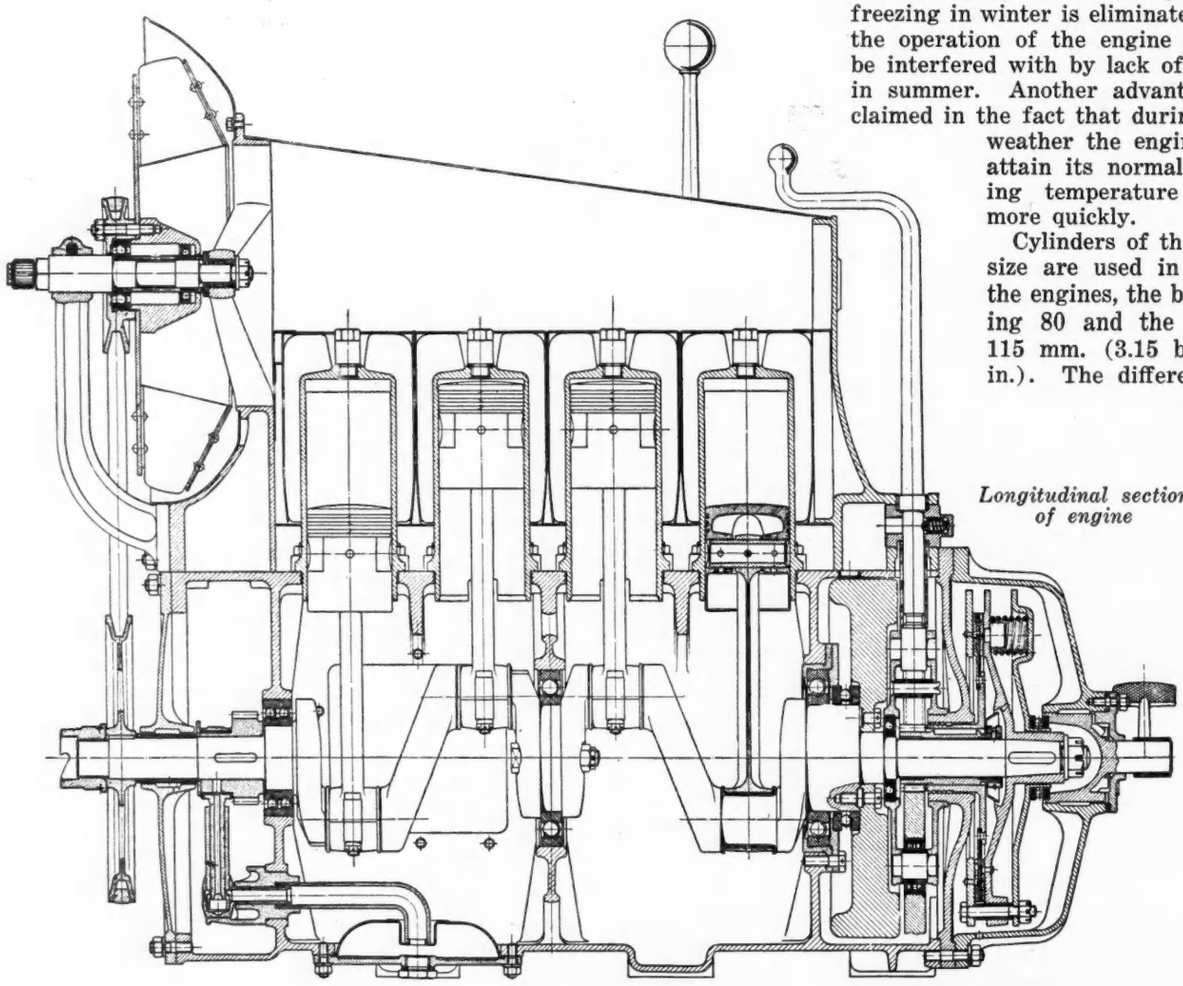
Units for use in road rollers and mine and industrial locomotives are cooled by suction blower. Self-contained feature facilitates mounting the powerplant.

FOR use on road rollers, mine and industrial locomotives, and other similar vehicles, the Austrian Daimler Motor Co., of Vienna, has developed a power unit comprised of an air-cooled engine which is built in two, four and eight-cylinder sizes, the last mentioned being the V-type. The unit seems to have been developed especially with a view to operation by unskilled labor, and embodies a number of features that should interest American engineers.

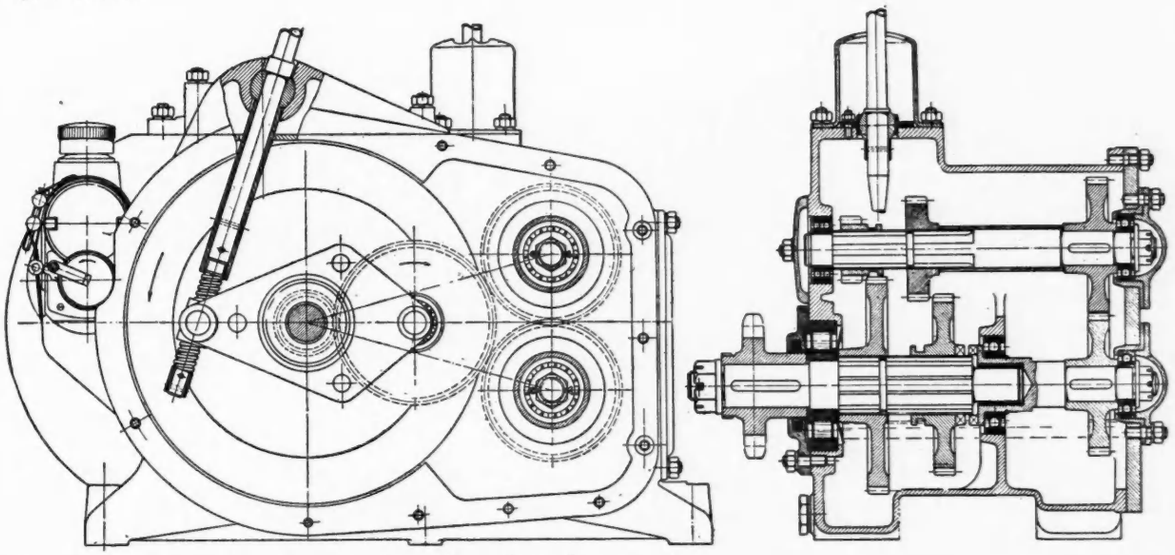
While the Daimler company itself manufactures mine locomotives in which these power units are used, it appears that they are being manufactured also for the market. The combination of engine, clutch and transmission in a single compact, self-contained unit greatly facilitates the mounting of it in almost any kind of vehicle. In the locomotives, it is mounted crosswise on the frame, for direct chain transmission to the driving axle.

It is claimed that the air-cooling system results in an engine of unusual dependability. It does away with the pump and with water connections, and the operator is relieved of all care with respect to the refilling of the cooling system. Damage from freezing in winter is eliminated, and the operation of the engine cannot be interfered with by lack of water in summer. Another advantage is claimed in the fact that during cold weather the engine will attain its normal working temperature much more quickly.

Cylinders of the same size are used in all of the engines, the bore being 80 and the stroke 115 mm. (3.15 by 4.53 in.). The different en-



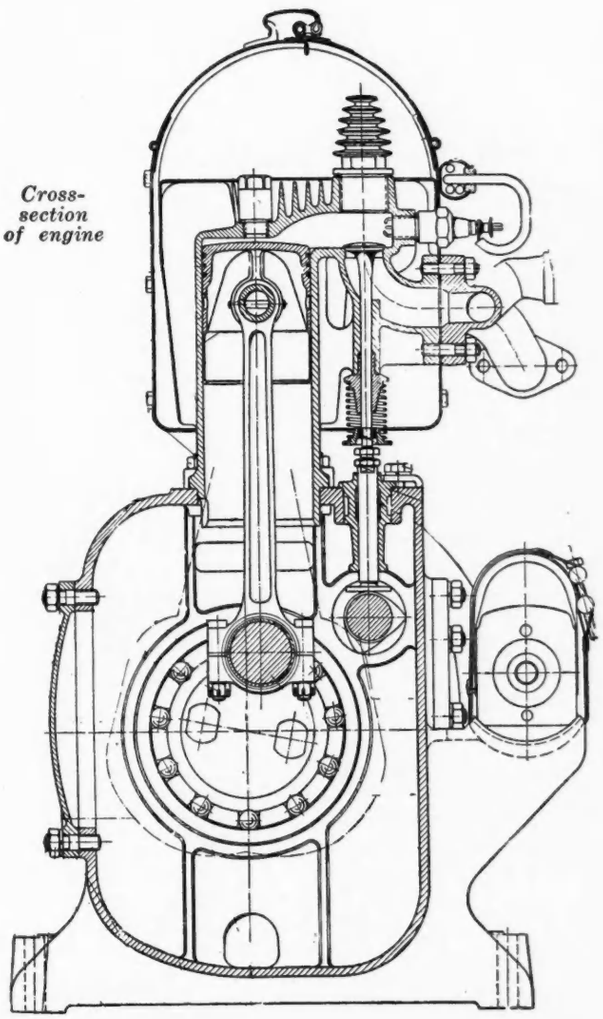
Longitudinal section of engine



Above — View of transfer gears and section through transmission

gines run at somewhat different governed speeds, the two-cylinder at 1400, the four-cylinder at 1000 and the eight-cylinder at 1200 r.p.m. At 1000 r.p.m., each cylinder develops about 3 hp., the rating of the eight-cylinder model at 1200 r.p.m. being 30 hp. The cooling system is of the blower type, an exhaust blower being used.

Cross-section of engine



In other words, the cooling air is drawn over the cylinder walls by the blower, instead of being forced over it. Another point in respect to which this engine differs from others using the blower cooling system is that the cylinders are of the L-head type, instead of having the valves in the head. The exhaust blower system probably is better adapted for use with L-head cylinders than with cylinders having the valves in the head, as with the former construction the upward current of air comes in more direct contact with those parts of the cylinder casting which surround the valve seats. Owing to the fact that with an exhaust blower system the density of the air in the jackets is less than with a system in which air is blown through the jackets, one would expect the maximum cooling effect to be somewhat less with the former.

The cylinders, which are cast separately, are provided with vertical cooling fins, which are surrounded by a close-fitting jacket. In operation, air enters the jackets at the bottom, where they are open, and is drawn through them by a centrifugal fan, which is mounted at the large end of a collector extending across the tops of the cylinders. In addition to being provided with air jackets, all of the cylinders are surrounded by a single sheet steel housing. In order that substantially the same amount of cooling air may pass through all of the jackets, the openings into the collector on top of the cylinders are graded, those closest to the fan being smallest. The collector over the cylinders is accessible through cover plates. In operation, these covers, of course, must be kept closed, as otherwise the air-cooling system would not operate properly.

A rather peculiar transmission is built together with this engine. On an extension of the crankshaft beyond the flywheel is mounted a driving pinion, which really is loose on the crankshaft but placed in driving connection therewith by a friction clutch back of it. This friction clutch is of the familiar single-plate type and is operated by means of a pedal. The driving pinion on the crankshaft meshes with an intermediate gear that is mounted on a rocking support or cradle controlled by means of a crank with screw and nut. This cradle can be moved angularly around the crankshaft axis and the intermediate gear thereby brought into mesh with one or the other of two equal-sized meshing gears in the transmission, which is located at the side of the crankcase. The train of four gears forms a transmission and reverse gear. A sectional view of the transmission is shown herewith.

Rating Management Effective Is Considered *Possible*

Steps have been taken to apply in industry the method devised by L. P. Alford and J. E. Hannum, who outlined their system at the last A. S. M. E. Annual Meeting

By K. W. STILLMAN

HOW to measure accurately the effectiveness of management long has been a question which has interested everyone connected with industrial enterprises, from the banker who was asked to finance the business, all the way down to the foreman who desired to know just how good his leadership was.

Many attempts have been made to accomplish this end by means of various efficiency and financial ratios, but none has given entire satisfaction. From the widespread approval that has been given the kilo man-hour method and the definite steps which already have been taken to put the idea to work in industry, it seems possible that at last there has been devised a means which offers considerably greater possibility for accurate and comparative results than has been available.

The kilo man-hour method was presented by L. P. Alford and J. E. Hannum at the last annual meeting of the American Society of Mechanical Engineers and was discussed briefly in *Automotive Industries* of December 15, 1928. Now that it has been decided by the Census Bureau that the 1929 manufacturing census shall include kilo man-hour data obtained from a selected group of industries, and since we understand that the automotive industry is very likely to be numbered among this group, more detailed information as to just what the K.M.H. method is, how it may be applied, and what may be expected of it, seems desirable so that members of the industry may make the fullest use of the data which they will be asked to supply the Census Bureau.

Table 1:

Percentage of Profit Compared With Selling Value of Product per K.M.H.—1925

Industrial Group	Percentage of net profit—1925	Constituent Product Group	Selling Value of Product per 1000 Man-Hrs.
Leather	3.26	Leather shoes	$1,120
Textiles	4.11	Yarn and thread	548
		Knitted underwear	1,115
		Cotton fabrics	1,320
		Rope and twine	1,330
		Hosiery	1,390
		Knitted sweaters	1,447
Lumber	5.38	Sash and doors	584
		Millwork—doors	1,160
		Furniture	1,440
		Woodenware	2,070
		Lumber	2,190
Paper	6.97	Writing paper	1,000
		Book paper	1,950
		Boxboard	2,180
		Wrapping paper	2,190
		Paper and pulp	2,825
		Newsprint	3,020
Printing	7.73	Commercial printing	2,370
Rubber	8.98	Rubber tires	5,080
Chemicals	10.15	Explosives	3,950
		By-product coke	4,700
		Lead products	6,030
		Petroleum products	7,570
		Soap	7,990
		Paint, varnish and lacquer	9,400
Automotive		Horns	803
		Wire wheels	1,730
		Engines	2,010
		Frames	2,340
		Springs	3,160
		Automobiles	6,410

In brief, the K.M.H. plan consists simply of setting up a number of factors upon the common base of the man-hour, or the thousand-man-hour, to simplify computations. By the use of such factors to indicate conditions and trends in every phase of industrial activity, with all reduced to a common base, it is believed that direct comparisons can be made not only between departments within a single plant, but also between plants in the same industry, and between different industries.

Before beginning their search for a common base factor, the authors of the paper decided that whatever it was it should be measurable by a common unit, universally known in industry, easy to handle in computation, and influential in its effect upon industrial operation. The man-hour was selected as best fulfilling the requirements. Workers are much the same wherever found and, if all the fa-

ness on *Kilo Man-Hour Basis*

cilities provided by management to increase production, such as mechanical equipment, planning, training, etc., were removed, the output of 1000 men would be about the same everywhere.

One question that arises in considering this choice is whether, in modern plants, machine tools are not even of greater influence upon operations than personnel, so that the common base might better be power consumption or some such factor. While this may be true in certain instances, and particularly so in the automotive industry, the authors believe that such a factor cannot be used as a common base for computations, since machines used for the same or for similar operations vary widely in different plants and frequently in a single plant. They submit that the one item which directly affects production, and which is much the same wherever found, is human effort. Furthermore, they state that the influence of machine equipment can be determined directly by the use of a K.M.H. factor applied to machinery investment, primary power, and similar items.

Table 2: Comparative Production Rates of Several Automobile Companies

Companies	Number of Employees	Number of Man-Hours Worked	Production in Number of Cars	Production Rate in Cars Per 1000 Man-Hours	Deviation of Rates From Weighted Mean
A	....	2,745,117	3,355	1.22	— 7.86
B	....	4,841,690	8,801	1.83	— 7.25
C	....	10,285,056	31,769	3.09	— 5.99
D	....	167,946,281	827,056	4.94	— 4.14
E	....	49,574,200	261,164	5.26	— 3.82
F	....	7,781,347	45,310	5.82	— 3.26
G	....	6,670,741	45,300	6.79	— 2.29
H	....	2,581,744	27,893	10.80	+ 1.72
I	....	19,816,711	32,122	16.20	+ 7.12
J	....	2,146,331	39,980	18.60	+ 9.54
K	Largest	106,200,000	2,090,959	19.70	+10.62
L	Smallest	1,621,958	59,074	36.40	+27.32
12	151,447	382,211,176	3,472,783	9.08	90.93

Mean deviation of rates	7.58
Coefficient of variation of rates, per cent	83.5
Ratio of maximum to minimum rates	29.9

Census Data

Number of Companies	Number of Employees	Production in Number of Cars	Ratio of Compiled to Census Data
297	197,728	4,178,247	83 per cent

	Amount (Dollars)	Unit Value Per Car (Dollars)	Value Per 1000 Man-Hours (Dollars)
Wages	341,210,401[1]	75.20	683
Cost of materials	2,108,191,812[1]	466.00	4,240
Value added by manufacture	1,089,930,821[1]	241.00	2,190
Value of product	2,952,650,573	706.00	6,410

[1] The value of product corresponding to these values is $3,198,122,633, which is 8 per cent higher than the value of product corresponding to the quantity of product. The rates have been adjusted accordingly.

The information required for establishing K.M.H. factors is simply the actual number of man-hours worked during the period to be studied. In collecting this data, however, Messrs. Alford and Hannum point out that working hours and not pay-roll hours must be used. When overtime is paid at time-and-half rates, for example, a man working two hours overtime would be paid for three hours work. In computing total man-hours, this item should be carried as two hours, the time actually spent on the job, rather than at three hours, for which payment was made.

With the total number of man-hours established, as many factors may be determined as is desired simply by dividing the number of man-hours into the quantities representing any of the industrial activities which may be of interest. The following factors have been offered by the authors of the plan as suggesting the range of information which may be indicated in this manner:

Factor	How Expressed
Productivity	Physical volume of product per kilo man-hour
Profit	
Manufacturing Net	Dollars per kilo man-hour
Fixed Capital Investment	
Buildings	Investment in dollars per kilo man-hour Square feet of floor space per kilo man-hour
Machinery	Investment in dollars per kilo man-hour
Primary Power	Horsepower utilized per kilo han-hour
Labor Permanence	Number of workers employed per kilo man-hour
Industrial Accidents	
Frequency	Number of lost-time accidents per kilo man-hour
Severity	Number of working hours lost per kilo man-hour

Costs	
Wages	Dollars per kilo man-hour
Material Cost	
Prime Cost	
Overhead Charges	
Manufacturing Costs	
Selling Price	Dollars per kilo man-hour
Value of Product	Dollars per kilo man-hour

From factors developed in this way, the authors believe that it is possible to make direct comparisons of period-to-period performance of a single industrial establishment, to compare the relative achievements of two or more concerns in the same industry and, at least as regards certain selected factors, to compare one industry with another.

For comparison of period-to-period performance within a single concern, there appears to be little doubt of the effectiveness of this method. The value of the product sold per kilo man-hour for one period compared with the same factor for a previous period undoubtedly provides information of immediate importance to the management; and when comparisons are made with other factors to see whether changes or improvements have been made in wage costs, material costs, labor permanence, machine tool utilization and other items, a very clear picture of progress is presented.

A similar comparison between two plants in the same industry and, still more, between different industries, may not appear to lend itself so readily to this method, but the authors of the plan assert that this is just as feasible as the determination of intra-industry relationship.

The point they emphasize in this connection, however, is that direct comparisons usually cannot be made on the basis of a single K.M.H. factor, but must be made on the basis of an analysis of several factors. If we were to try to evaluate and compare the effectiveness of management used in making Fords with that applied in producing Rolls-Royces, for example, there obviously would be fundamental differences in the operating methods to be considered.

Machinery investment factors of these two concerns scarcely could be compared directly without considering other factors, and this applies somewhat throughout the list of factors which might be set up. The one exception to this rule which Messrs. Alford and Hannum assert exists is that, in general, sales value of the product produced per kilo man-hour gives directly a measurement of the effectiveness of management, if not always from a strict profit and loss standpoint, at least as a measure of the social value of the industry involved.

In comparing a farm with a machine shop, for example, it is altogether likely that the K.M.H. factor for value of product will be much higher in the latter than for the average farm, since the machine shop will have its operations mechanized to a much larger extent than probably is possible at the present time for farm work.

In such a case it is pointed out that if we are to accept a third social doctrine and add to the two doctrines asserting the sacredness of human life and the dignity of human labor one announcing the preciousness of human effort, the unmechanized farm is seen to be of much less social value to the community than the machine shop where greater progress has been made in conserving human effort.

While this particular discussion may be rather academic, an interesting question arises as to whether the K.M.H. factor for value of product does not evaluate profitable operation. When we consider an automotive plant which makes all the component parts for its car from raw materials, and compare its operations with another plant which simply assembles finished components purchased from others, there appear to be so many factors besides man-hours that influence the profitable operation of the concern as to make direct comparisons impossible.

Granting the mental difficulties involved in accepting such a conclusion, the authors have compiled a comparative table of profits and K.M.H. sales value factors for seven different industries. The industries differ widely in their processes and operations, but, as can be seen in Table 1, with minor exceptions, the percentage profits gained in 1925 were in direct proportion to the selling value of their product per 1000 man-hours. It doesn't look like a simple coincidence, but what its true value may be must be decided at the end of considerable more analysis than has yet been made. At least it tends to lend authority to the authors' assertion.

Data From Census

In order to illustrate better the kind of information that may be obtained by use of the K.M.H. method, several tables are presented herewith showing data compiled from 1925 manufacturing census returns from a number of representative automotive concerns.

Table 2 gives information from 12 concerns manufacturing passenger cars. The 12 concerns produced, during 1925, 83 per cent of all cars built, so they are representative of the industry. The K.M.H. factor presented is that of volume of production as expressed in the number of cars built during the year per kilo man-hour. For the automotive industry, where there is such a difference between products of the various plants, this particular factor is of less value than almost any other that might be determined, but it still suggests certain things of interest.

For example, Company L had the smallest number of man-hours of the 12 concerns, was third from the top in the actual number of cars produced and led its nearest rival by nearly 100 per cent in the production rate per K.M.H. Possibly no definite opinion as to the relative effciency of the management of this plant could be obtained from these figures. If, however, in addition to the physical volume factor, there were available other factors of value for products, investment in machines and buildings, power consumption, etc., it would be possible to correlate the data in such a way that these 12 concerns could be classified definitely according to the effectiveness of their individual managements.

Table 3:

Automobile Parts

Number of Companies	Number of Employees	Number of Man-Hours Worked	Production in Tons	Production Rate in Tons Per 100 Man-Hours	Deviation of Rates From Weighted Mean
A	Largest	1,582,715	9,283	5.86	—6.99
B	Smallest	155,280	1,500	9.64	—3.21
C		455,535	4,778	10.50	—2.35
D		481,000	6,100	12.69	—1.16
E		956,166	24,850	26.00	14.15
5		3,630,696	46,511	12.85	26.86

Mean deviation of rates 5.37
Coefficient of variation of rates 42%
Ratio of maximum to minimum rates 4.43

Table 4:

Automobile Parts

Product	Ratio of Compiled to Census Data per cent	Number of Man-Hours Worked	Production in Number	Production Rate in Number per 1000 Man-Hours	Census Data: Production in Number	Census Data: Value of Product (Dollars)	Unit Value of Product (Dollars)	Value Per 1000 Man-Hours (Dollars)
Engines	8.7	2,418,749	26,487	10.96	304,091	55,612,881	183.00	2,010
Frames	14.9	1,900,000	400,000	210.0	2,694,550	29,957,983	11.15	2,340
Horns	25.6	1,711,840	1,090,491	636.0	4,270,741	5,389,626	1.26	803
Wire Wheels	9.1	572,832	111,235	194.0	1,228,100	10,969,577	8.92	1,730

Certainly, with two concerns turning out less than two cars per year per K.M.H. and another producing 36 cars per year per K.M.H., and the remaining seven companies covering the entire range between, different design or selling prices of the cars built cannot explain such wide divergence. A very important share of the difference must be attributed to management, and with the various factors available it should be relatively easy to determine in just what phase of management particular concerns are ineffective of average ability or unusually efficient.

In Tables 3 and 4 are given similar data, all for 1925, covering five representative makers of automobile parts and several miscellaneous groups making engines, frames, horns and wire wheels. In Table 3 is shown a wide divergence in the production volume factor of the five parts companies studied. Can a spread of six tons per K.M.H. to 26 tons per K.M.H. be explained solely on a basis of the kind of product being made or must some of this variation be laid at the door of management? Analysis of other factors would furnish the answer to this question without delay.

The particular technique of correlating the various factors into a final answer to the question of how effective is the management of a concern or of an industry, is still to be worked out. The sponsors of the K.M.H. idea believe that this requires a great deal more study of actual operating data and comparison with known conditions than has been possible to them. The various factors which may be set up are likely to vary in their influence on successful operation, and it is only by experimentation that the selection of the proper factors and determination of means synthesizing them into a final evaluation of management can be accomplished.

The one thing necessary before this method can be given a fair trial to determine its true worth is more information. At the present time there are many plants both in and out of the automotive industry which are and have been charting their own progress by the man-hour method or some simple variation of it. Before these concerns or others can make full use of such a plan, there must be available comparable figures from other plants in the industry, and from other industries, so that they can aim at outdoing the best record made in industry, rather than simply bettering their own previous best efforts.

If, as is expected now, the 1929 manufacturing census collects this data from the automotive industry, it should be of great help. It will be nearly two years, however, before this information will be available, and meanwhile, if the K.M.H. method is practical and will produce the results expected of it, automotive executives will want to be able to utilize it immediately. To do it effectively appears to mean that some agency should be permitted to compile up-to-date operating data, such as is shown in the tables herewith, and present, for the benefit of all companies as marks to shoot at in their own operations, the average results of the industry as well as the best results obtained in particular operating activities by the most efficient concerns.

Reo Gold Crown Engine Uses New Chrome Nickel Alloy

CHROME nickel alloy iron cylinder blocks, with seven times the endurance qualities of the close grained iron commonly used by others is the latest contribution to Speed Wagon long life and low cost of maintenance.

Valve grinding, valve seat wear and valve tappet adjustment are said to be greatly reduced by the use of this chrome nickel alloy. In all trucks of medium capacity requiring both speed and hauling power, the rear axle gear ratio used is somewhat lower than passenger car requirements. Therefore, the engine must turn at a higher rate of speed, and hence the valve seats have a tendency to pound down and deteriorate faster also, and with more piston travel per mile the wear of cylinder block is comparatively greater. This new chrome nickel alloy, made to the Reo formula, imparts to the Gold Crown engine much longer life and greater endurance.

High speed engines for modern trucks traveling at high speeds present severe lubrication problems. The natural hardness of this new chrome nickel alloy and the ultra modern lubrication system backed by an oil cleaner, oil cooler and crankcase ventilation, gives greatly increased life to this new Reo engine.

Pump Delivery

A FORMULA for the delivery of gear-type pumps is given in *The Engineer*, by Henry E. Merritt, D.Sc. The formula is as follows:

$$D = E\,K\,C^2\,f \text{ cu. in. p. revolution,}$$

where E is the volumetric efficiency; K, a factor depending on the number of teeth in each gear; C, the center distance of the gears, in in., and f, the face width in in. The values of K for different numbers of teeth are as follows: Eight teeth, 0.84; nine, 0.73; 10, 0.65; 11, 0.59; 12, 0.53.

Low Temperature Lubrication Guide Not Found in Viscosity Tests

Experiments with airplane lubricants tend to show pump pressure at various temperatures a better index of adaptability.

By C. M. Larson
Supervising Engineer, Sinclair Refining Co.

LONG-DISTANCE flying has brought about a change in lubricating oil requirements, as a plane may leave a field in the North where the temperature is 15 deg. Fahr. and land at a field in the South where the temperature is 78 deg. Fahr. The old method (used during the War) of preheating the oil before it is placed in the engine, is now obsolete. It was necessary, therefore, to investigate the problem of fluidity so as to make the United States Government Liberty Aero Oil Grades 3 and 4 suitable for present-day flying conditions. The investigation made clearly showed that the Furol viscosity and Greiner charts fail to indicate what an oil will do in actual service.

The method of attack was to investigate the Furol viscosity-temperature curves of several blends from different crudes, and blends from dewaxed cylinder stocks. These oils were run also at ground temperatures in a Wright Whirlwind pump assembly driven by a 3 hp. electric motor (Figs. 1 and 2).

The oil under consideration and the whole Wright pump and assembly were chilled to a predetermined temperature. The motor-driven pump was started and when the discharge pressure reached 60 lb. p. sq. in., the rate of flow, in grams per second, was recorded, the motor speed being 1500 r.p.m. during all runs.

During each run the following readings were taken at each temperature increment:

T_p—Temperature of Wright pump (thermometer against pump casing)

T_1—Temperature of oil in tank near suction.

T_2—Temperature of discharge oil.

P—Pressure of discharge oil (60 lb. p. sq. in.)

V—Vacuum or suction pressure (inches of mercury read on manometer)

G—Oil delivered (grams)

S—Time of flow in seconds

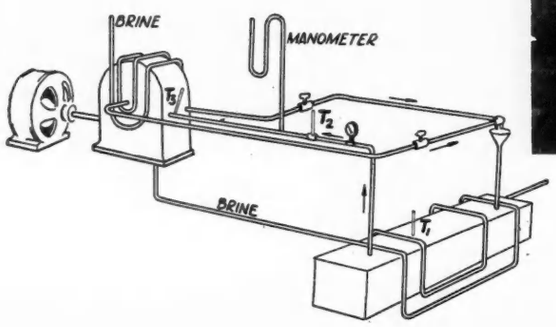
G/S—Rate of flow (grams per second)

R.P.M.—Read on tachometer.

Sec. for 60 lb.—Time from starting of pump to the moment when 60 lb. pressure was reached, with the discharge valve properly set, in seconds.

Different gradings of the oil tested with respect to their fluidity at low temperatures are obtained from the Furol viscosity-temperature curves and the results of tests in which the oils were circulated through the pump assembly. For instance, oils Nos. 16, 14 and 13 have the same viscosity at 38 deg. Fahr., but oil 13 had a rate of circulation of 27 grams per second, oil 16 a rate of 46 grams per second and oil 14 a rate of 68 grams per second. The most interesting results were obtained with oils Nos. 13 and 12. Oil No. 13 has the best Furol viscosity-temperature curve, and analysis proved that oil 12 becomes solid at a higher temperature than oil 13, yet oil 12 pumped very well at low temperatures.

The difference in the nature of the wax content of paraffine base oils can be illustrated by using cup grease to represent crystalline wax and fiber grease to represent amorphous wax. The two having the same con-



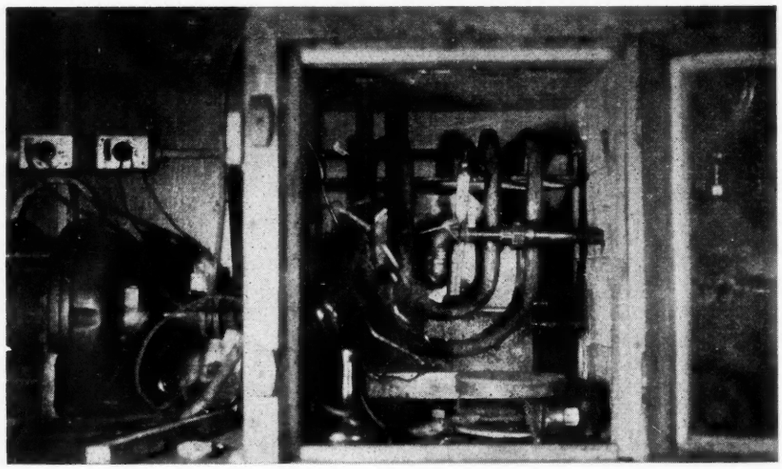


Fig. 1 (left)—Diagram of experimental set-up

Fig. 2 (above)—Showing Wright pump assembly in temperature control cabinet and electric motor for driving it outside

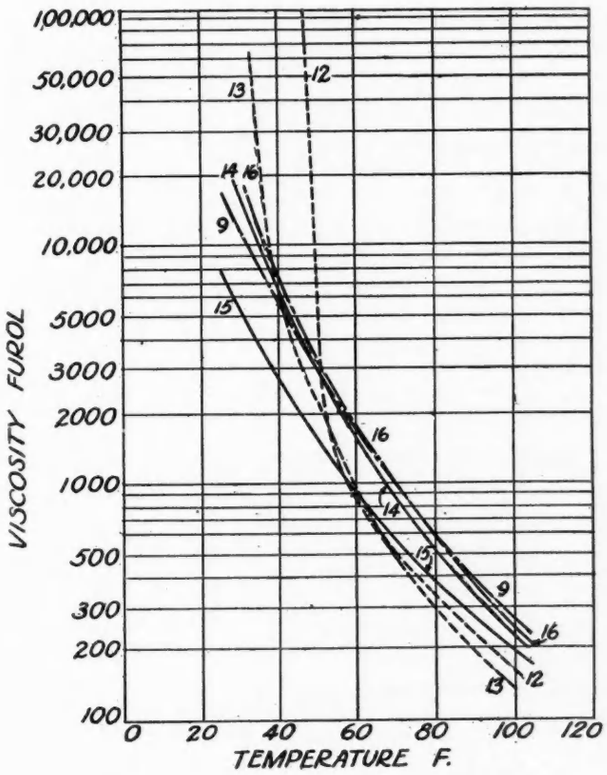


Fig. 3—Relation between temperature and Furol viscosity (Greiner curves)

sistency, the former has the lower shear. That is why oil 12 with the higher pour point and higher Furol viscosity pumps easier than oil 13, because oil 12 has a crystalline wax content while oil 13 contains an amorphous wax.

It was hoped that fluidity would prove to have a definite relationship to the product of viscosity and pour test, but this does not seem to be the case. It would appear that the small pressure head of the Furol viscosimeter is insufficient to give the true fluidity relationship of aircraft lubricating oils. However, the larger jet of the Saybolt Furol viscosimeter makes it possible to study the viscosity-temperature curve down to a lower temperature than is possible with the Saybolt Universal instrument. The constant pressure viscosimeter does not seem to be a solution of the problem either, as the effect of drawing oil through ¾-in. suction piping and the channeling effect of the oil, which resists its entrance into the tooth spaces of the gear pump, are not duplicated in a short-tube constant-pressure viscosimeter, and even less in the Furol viscosimeter.

The Wright pump (Fig. 2) and oil storage tank were enclosed in separate cabinets, each provided with brine coils, heaters and fans, for temperature control. The oil lift was about 18 in. (a manometer in the suction line showed the degree of vacuum) and oil was delivered to the rear main bearing which had no journal but was sealed by two plates. The pressure was maintained at 60 lb. p. sq. in. by means of a valve in the discharge line and was read off on a pressure gage in the discharge line. The rate of flow (grams per second) was determined at various temperatures, the procedure being to adjust the valve in the discharge line so that the pressure reached 60 lb. p. sq. in. one minute after starting the motor. The oil flow was obtained during the next minute (a 100 cc. beaker and a stop watch being used for accuracy) and a second flow determination was made during the next minute. The average value of these two rates was used for plotting the curve, the pump speed being determined during the next succeeding minute.

At low temperatures some of the oils offered such resistance to starting that the circuit breaker in the motor line opened repeatedly and many trials were necessary before the motor would continue to run. The number of trials to start the motor were recorded, as a crude measure of the starting torque or resistance offered by the oil when used in the airplane engine.

It is interesting to note that certain oils impose such a drag on the motor that it will not start, even after many trials. The motor is practically locked by the adhesive oil in the pump. After many such trials, the motor became very hot, and in some cases it smoked badly.

The time in seconds for the pressure to build up to 60 lb. p. sq. in. was also determined, as a rough measure of the viscosity of the oil in the suction line. The motor was stopped as soon as possible so that the pump would not reach too high a temperature, as much time was consumed in allowing the pump to cool down again. Seven different oils were tested.

An extract from the log sheets placed the oils in the following order when considering the starting torque or effort necessary to start the pumps at low temperatures:

Oil No.	Lowest temperature at which pump will start	Number of trials necessary before pump would continue to run	
16	17	3	
15	16	8	
13	20	39	
14	26	5	
9	27	38	(Motor very hot)
12	28	1	(No oil flowing, no reduction or pressure on suction side)
5	29	15	(Speed very low)

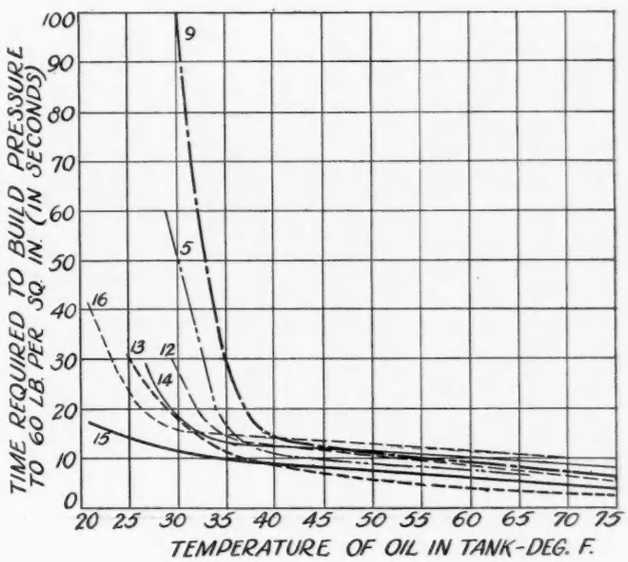


Fig. 4—Relation between temperature and time required to build up pressure in discharge line to 60 lb. p. sq. in.

The Furol viscosimeter is very similar to the Saybolt universal viscosimeter, the only difference being that the orifice through which the oil is allowed to flow is larger than in the Saybolt universal instrument, which makes the Furol suitable for more viscous liquids. The Furol viscosity is the time in seconds required for 60 cc. of liquid to pass through an orifice at the bottom of a cylindrical container of specified dimensions, the nominal diameter of the outlet orifice being 3.15 mm. and the nominal head above the bottom of the orifice tube, 125 mm.—Editor.

Lowest temperature at which pump continues to run on first trial:

Oil No.	Temperature
16	26
12	29
5	32
13	34
15	35
14	36
9	37

Fig. 4 clearly shows the time required (in seconds) to build up the pressure to 60 lb. p. sq. in. at various temperatures.

Reference to Fig. 5 discloses that the *G/S* curve of the oils which the Greiner curves (Fig. 3) show to contain considerable wax are smooth curves rising almost vertically and swinging to the right with higher temperatures. The *G/S* curves of the oils that have fairly straight Greiner curves do not rise so abruptly and have a pronounced knee at about 332 deg. Fahr., after which the curve shows an upward trend with higher temperatures.

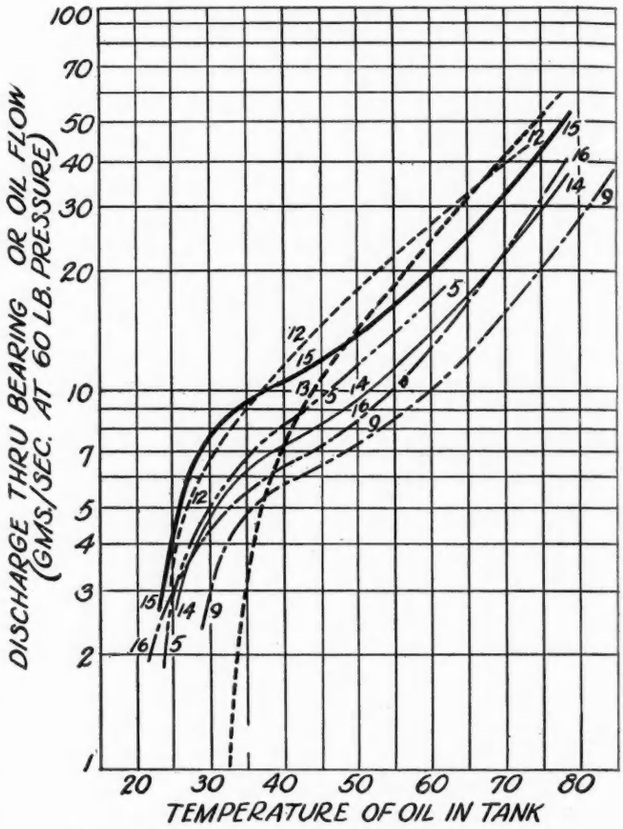


Fig. 5—Relation between temperature of oil and rate of flow through bearing

Automotive Research at the Bureau of Standards

IN the annual report of the Director of the Bureau of Standards, an account is given of investigations made on automotive engines, for which purpose an appropriation of $25,000 was available. In an analysis of data on engine starting, it is shown that a relation exists between the A.S.T.M. distillation curve and the equilibrium distillation curve at 5 and 15 per cent evaporated.

Subsequent analysis of volatility data obtained on 25 diverse gasolines showed that similar relations hold at any percentage evaporated from 10 to 90 per cent, these relations being general and independent of the specific characteristics of the gasoline. Thus, over this range, the complete equilibrium volatility curves of interest in engine performance, covering air-vapor mixtures from 8-1 to 20-1, may be obtained readily from the customary distillation test without additional experimentation. It has also been shown that the dew point for any desired mixture of any gasoline and air may be computed from the A.S.T.M. 90 per cent point.

Economic volatility of motor fuels—The effect of fuel volatility on engine acceleration is the aspect of this problem which is now being studied in cooperation with the American Petroleum Institute, the National Automobile Chamber of Commerce and the Society of Automotive Engineers. A new spark accelerometer, giving records of high precision, has been developed, and a description of this instrument, together with preliminary acceleration data on six fuels, will soon be published.

Anti-knock characteristics of fuels—Cooperation has continued with the automotive and petroleum industries in the effort to find some satisfactory common basis for rating antiknock motor fuels. Joint tests in which various laboratories undertook to rate the same set of fuels have shown how difficult it is at present to correlate the results obtained by different laboratories. The solution of this problem may be found in the general adoption of a common test engine and procedure, or it may require the extended study of typical methods and equipment by one or more laboratories.

Properties of oxidized oils—The effect of the products of oxidation on the properties of motor lubricating oils has been studied to discover to what extent these effects can be predicted by a knowledge of the oxidation number. Especial attention is being paid to the corrosive nature of oxidation products.

Phenomena of combustion—More than a thousand photographic records of explosions at constant pressure have demonstrated that it is possible from the velocity coefficients of carbon monoxide and methane to predict the flame velocity of any composite fuel made up of these ingredients for any mixture ratio of fuel and oxygen that will ignite. The explosive reaction of gaseous mixture containing hydrogen is more complex.

Tire Needs of Truck and Bus Concern the *Manufacturer*

Balloon sizes have established themselves in the bus field, but are not so widely used in the trucking business, says a Firestone Company representative.

IN a talk on "The Construction and Use of Truck and Bus Tires" made at a recent meeting of the Northwest Section of the S.A.E., at Portland, Ore., F. W. Stavely of the Firestone Tire & Rubber Co. of California, said that 15 years ago most tire treads were white, because at that time zink white was the accepted filling material for tread compositions. One reason for the use of zink white was that it could be obtained in finer grain form than any other material. Later, it was found that certain forms of gas black have a much finer grain than zink white, and make a better-wearing tread, hence all treads today are black.

A large contact area on the tread is desirable, he said, as it affords a greater tractive surface and distributes the wear. The tread contour is limited, however, as it is essential to avoid localizing the flexing action of the carcass.

The function of the cushion and breaker in a tire is to distribute the road shock impact and shearing stress, and thus overcome the tendency for localized action at the top of the tire carcass, Mr. Stavely continued. The double cord breaker construction, which consists of two narrow plies of cord fabric over the crown of the tire, is used extensively in heavy duty tires. This construction not only gives better distribution of road shock in the large tires, but also a better anchorage of the tread to the carcass.

The plies of rubber-coated fabric that constitute the tire carcass are cut on the bias, and assembled in the tire so that the cords in adjacent plies run in opposite directions. This gives greater strength and results in a more uniform distribution of load on the individual cords in the tire. Some manufacturers use an extra heavy gage gum between the plies of truck and bus tires. This provides additional insulation between the plies, thus overcoming any possibility of ply contact, which might result in tire failure.

The beads of truck tires are made up of several plies of wire strands. What are known as single beads consist of one group of wires, while twin beads consist of two individual groups of wires in each bead. The twin bead construction affords greater bead stability and permits a better anchorage of plies around the bead wire, due to the fact that a greater number of plies can be anchored around the twin beads and yet keep the bead as low as possible in the tire.

It is generally accepted that best service is obtained from high-pressure pneumatic truck tires when the load is such that the deflection of the tire does not exceed 14 per cent of the cross-section. With bus balloon tires, a maximum deflection of 18 per cent is the limit, while high-pressure and balloon passenger car tires may deflect 15 and 21 per cent respectively. Keeping these limitations in mind, the recommended maximum load-carrying capacity of a tire is, roughly, the product of the air pressure and the area of contact of the tire with the road. The area of road contact is largely determined by the diameter and cross-section of the tire and the tread contour.

The ply strength of the carcass usually is determined by performance tests. The bead contour is made to conform with the rim contour. While many laboratory and indoor tests are made on tires, the usual practice of the larger companies is to test their product on their own test fleets before releasing any new development to the tire user.

High-pressure tires for trucks are designed for 20-in. and 24-in. wheels. The recommended load and inflation pressures for these tires are given in the table:

Capacities of High-Pressure Pneumatic Truck Tires

Tire size (in.)	6	7	8	9	10
Rim size (in.)	6	7	8	8	10
Load for 20-in. (lb.), dia.	2200	2800	3600	4500	5500
Load for 24-in. (lb.), dia.	2500	3200	4000	5000	6000
Air pressure (lb. p. sq. in.)	90	100	110	120	130

Balloon tires for bus and truck service are made in 20 and 22-in. diameters, and call for an inflation pressure of 50 to 75 lb. p. sq. in. The bus balloon tire has established itself in the transportation industry, and it has been proved that increased riding comfort can be obtained without sacrificing tire performance. Truck balloons are less widely used.

Large bus fleets equipped with bus balloon tires have been operating on the Pacific Coast for the last three years. Their operators have found that this type of tire equipment reduces maintenance, gives fewer road delays and increased satisfaction to the passengers.

For a time there was opposition to bus balloon tires for stage equipment, as certain operators feared the hazards accompanying the occurrence of a puncture at high speed. It has been proved repeatedly during the last three years that no greater hazard results from punctures with bus balloon tires.

IT is generally accepted that the best service is obtained from high-pressure pneumatic tires when the load is such that the deflection of the tire does not exceed 14 per cent of the cross section, says F. W. Stavely of the Firestone Tire and Rubber Co. of California. With bus balloon tires, he continued, a maximum deflection of 18 per cent is the limit, while high-pressure and balloon passenger car tires may deflect 15 and 21 per cent respectively.

New German Cross-Country Car Drives to All Six Wheels

Vehicle with six-cylinder engine and independent springs for each wheel, designed for military purposes. Eight-cylinder model has rigid axle.

By Edwin P. A. Heinze

THE design of small but powerful vehicles adapted for cross-country service has interested all military powers for years past. Much work along this line has been done in Great Britain and France, and now Germany has followed suit and produced two new vehicles for cross-country travel. One of these is the Horch six-wheeler, which is equipped with an eight-cylinder passenger car engine and has rigid rear axles; the other is the Selve, which is fitted with a six-cylinder passenger car engine and is featured by drive to all six wheels and independent springing of all wheels. In the Horch power is applied to the four rear wheels only.

Cars of this type, capable of carrying loads up to about a ton, are intended for scouting work, as well as for carrying light anti-aircraft guns and machine guns. They must be tolerably fast and yet must be able to make their way over any kind of ground. Neither sand nor mud must stall them, which implies that they must have large ground contact area and a surplus of traction effort available. In view of these requirements, much attention has been given to creeper tracks of non-metallic construction, an example of these being the Kegresse, which was developed in France. It is obvious, however, that if similarly good results can be obtained with a wheeled vehicle, the latter is to be preferred as obviating the complications inherent in the belt drive.

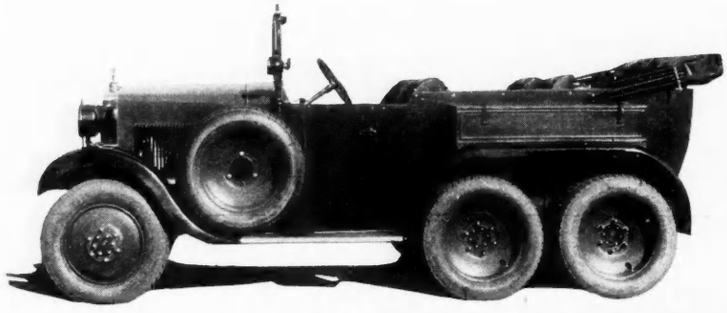
The Selve Automobile Works, of Hameln, has so far built two of their six-wheel drive vehicles, these being fitted with six-seater bodies. There are three seats on each side, with a passage in between. In addition to a door at each side of the body in front, there is a central rear door. Ready for the road the car weighs 5920 lb., of which 2315 lb. is carried by the two front wheels and the rest of 3595 lb. on the four rear wheels. All axles, by the way, may be fitted with dual wheels.

The frame of this six-wheeler is of much the same design as that of the standard passenger car, but there is a subframe extending back from the center cross-member, on which are mounted the driving gear housings for the rear wheels. When the car is fully loaded the top flange of the frame is 26.9 in. from the ground, while the ground clearance under the same condition is 10.2 in. The engine is mounted in a relatively high position, this being necessary because the propeller shaft to the front axle has to pass underneath it; but a high location of the engine also has the advantage that it permits the car to ford shallow bodies of water without the operation of the engine being affected. As a matter of fact, the car can pass safely through water 27 in. deep.

As already mentioned, a six-cylinder engine is fitted, with a bore and stroke of 2.91 by 4.72 in. (189 cu. in.). It has a stock transmission of the four-speed type flanged to it and is located back of the front axle in the usual position. Bolted to the rear of the standard transmission is a two-speed drop gear, from which connections are made by propeller shafts to the front and rear driving gear housings. Combined with the standard transmission this two-speed auxiliary transmission gives eight forward and two reverse changes of gear speed, the overall reduction ratios for forward motion ranging between 6.25 to 1 and 75 to 1.

Final drive to all three axles is through worm gears, and all three driving gear housings with their driving gears and differentials are identical. Since all of the differential housings are mounted on the chassis frame the universal joints have to take care of chassis distortion only, and fabric-type joints are used.

Midway between the two rear driving axles there is a dead axle supported in brackets depending from the frame side rails. On the projecting ends of this axle are pivoted two arms, the ends of which carry hollow stub axles for the hubs of the road wheels. These arms take up the torque and propulsion, and the weight of the chassis and body is transferred to their free ends through an inverted semi-elliptic spring on each side. These springs have a pivotal mounting on a frame bracket at their middle, while their ends are shackled to the ends of the arms carrying the wheel spindles. Drive to the wheels is through short shafts with two universal joints of the metallic type each. The front construction is of the Voran type as previously de-

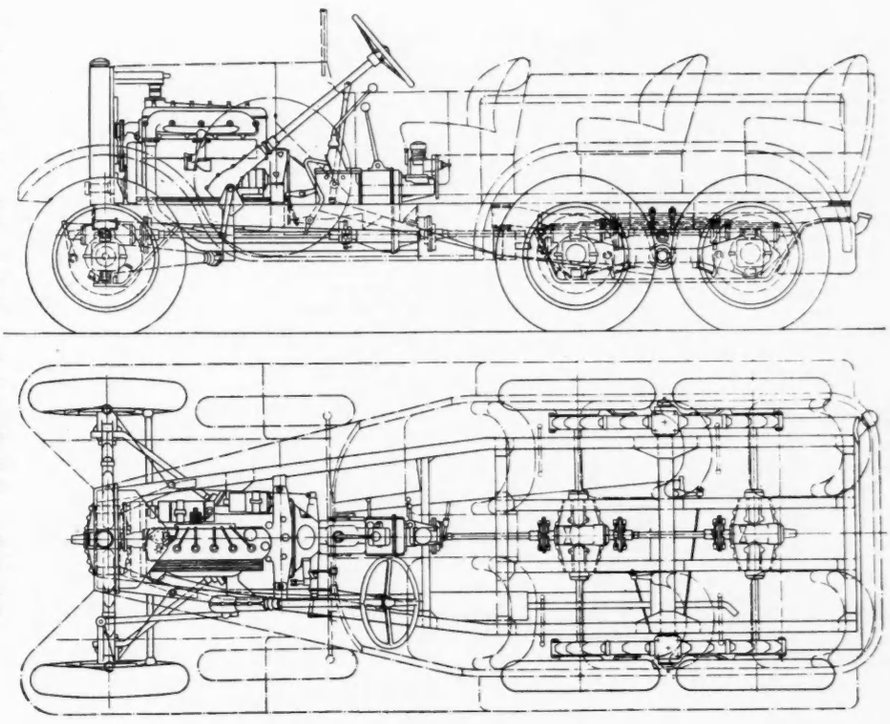


Selve cross-country vehicle with drive to all six wheels

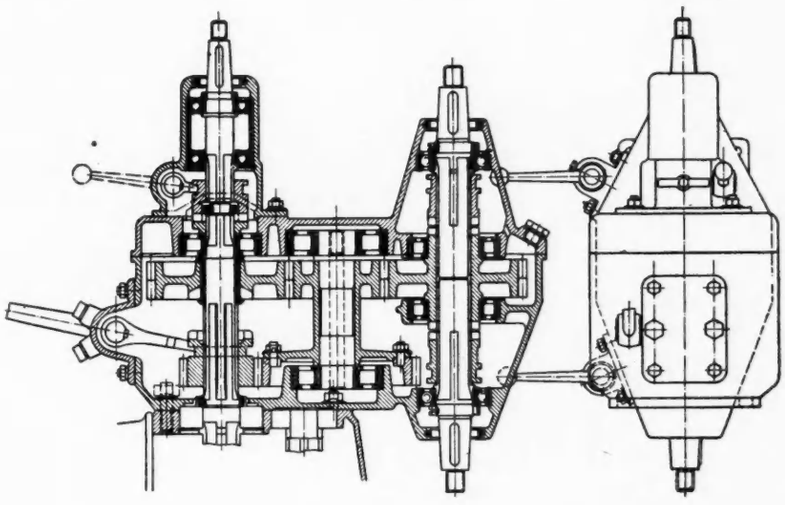
scribed in these columns. Brakes are fitted only to the four rear wheels.

The disk wheels are shod with 33 by 6.2 in. low-pressure tires, and two spare wheels are carried, which may be fitted as dual wheels at either front or rear, to increase the ground contact area under conditions where this is desirable. They may, of course, be used also to replace any of the wheels on the car. The distance between the front axle and the forward rear axle is practically 100 in. while the distance between the two rear axles is 37.4 in. The track is 59 in. with single wheels and 64.9 in. with dual wheels.

The makers claim that the car has a maximum speed of 43 m.p.h. on level roads and that it can climb a maximum grade of 60 per cent.



Above—Side elevation and plan view of the Selve six-wheeler, which is driven on all six wheels. All of the three driving gear housings are supported on the chassis frame, so that each road wheel is independently sprung and unsprung weight is reduced to a minimum



On left—Two-speed drop gear of the Selve six-wheeler, from the lowest shaft to which connection is made to the front and rear axles respectively. It will be seen that either of the two propeller shafts can be disconnected by means of a jaw clutch

Variation of Engine Power With Altitude

THE change of power of aircraft engines with altitude has been the subject of considerable discussion. However, only little data from direct measurements of the power delivered by aircraft engines during flight has been published. In Report No. 295 of the National Advisory Committee for Aeronautics, by W. D. Gove, are given the results of direct power measurements of a Liberty 12 airplane engine taken with a hub dynamometer at standard altitudes from zero to 13,000 ft. Six flights were made with the engine installed in a modified D H-4 airplane, the tests having been conducted at the Langley Memorial Laboratory.

In the report the relation of brake horsepower to altitude is compared with two theoretical relations and with the experimental results for a second Liberty engine given in N.A.C.A. No. 252. For comparison, the rate of change in power with altitude of a third Liberty engine, measured with a calibrated propeller, is also given.

The data presented substantiate the theoretical relation of brake horsepower to altitude based on the correction of ground level indicated horsepower for changes in atmospheric temperature and pressure with the subsequent deduction of friction horsepower corrected for altitude. The equation for this relation is

$$B.HP_a = B.HP_o \left[\left(\frac{P_a}{P_o}\right) \left(\frac{T_o}{T_a}\right)^{1/2} \left(1 + \frac{\lambda - \lambda n}{n}\right) - \left(\frac{\lambda - \lambda n}{n}\right) \right]$$

where P is the absolute atmospheric pressure, T is the absolute temperature, n is the mechanical efficiency of the engine at sea level and λ is the ratio of mechanical friction to friction horsepower at sea level. The subscripts $_o$ and $_a$ denote sea level and altitude conditions respectively.

All-American *Aircraft Show* Opens

Airplane manufacturers of the country will display many of their products publicly for the first time. Advance information indicates structural standardization tendency.

By ATHEL F. DENHAM

WITH every section of the country represented at the All-American Aircraft Show opening in Detroit today, it should give a good cross-section of the aeronautical industry. Unfortunately, space limitations and demands for deliveries will make it impossible to exhibit many of the larger types of ships that are used for transport work. The show, therefore, probably will be more interesting to the private owner and small commercial operator, or air service organization, than to the large transport companies.

Nevertheless, there will be considerable to interest every branch of the aircraft industry. The new planes will be of interest to engineers and serve as a basis for studying current trends in design. Information at hand indicates a growing tendency toward structural standardization. Chrome molybdenum fuselages and wood wing structure are found on a large number of the planes, but all-metal construction is likewise making considerable headway, with combinations of the two also appearing.

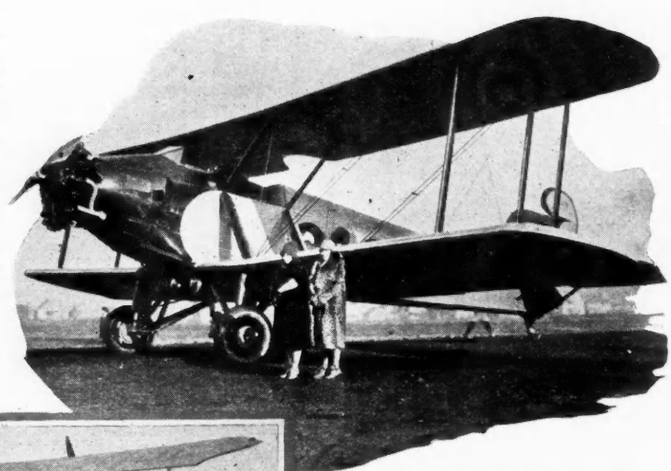
Efficiency in aerodynamic design evidently is greater if the top speeds claimed can be taken as a criterion, for landing speeds and wing loadings do not appear to have increased materially. Power loading, on the other hand, does run quite high, in some cases well over 20 lb. per hp.

Brakes are becoming more and more universal. Ox powerplants have almost disappeared. The ships that are designed for those units are found to have a high power reserve.

Since it is not the purpose of this article to give a complete advance coverage of the Detroit show, it being rather intended to acquaint the aircraft industry with some of the new developments, only such planes are described as have not previously been exhibited publicly. Details of improvements of a number of "old line" airplanes also are discussed. The exposition is scheduled to close next Sunday, April 14.

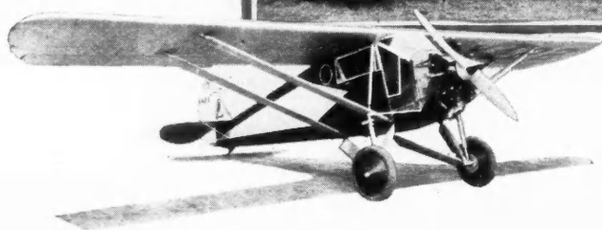
Taking the companies alphabetically, the American Aeronautical Corp. will exhibit its flying boats and amphibians, manufactured at Port Washington under license from the Italian Savoia Marchetti company. The plant is said to have a capacity of 500 planes per year. Deliveries are to start in May on the three-passenger biplane amphibian, the S-56. With a 100-hp. motor, the ship is said to have a maximum speed of 92 m.p.h., with a cruising speed of 80 m.p.h. A larger, 500 hp. pusher type enclosed seven-passenger cabin flying boat, available with retractable landing gear, the S-62, with top speed of 134 m.p.h., also is going into production.

A feature among products of the American Eagle Aircraft Corp. this year is the "Imperial," a four-passenger, cabin, high wing monoplane of full cantilever plywood construction, powered with Wright J-5 engine. Structural details are similar in other respects to the popular American Eagle A-129 three-place open cockpit



Above—The first commercial ship of the Great Lakes Aircraft Corp. is this converted Martin plane powered with a Hornet engine. It is a six-passenger ship

Right—This view of the Pitcairn Super mailwing shows its adaptation to passenger use by the addition of a rear cockpit. Note the N.A.C.A. cowling for the radial engine



Left—The St. Louis Cardinal, a two-passenger ship for individual use lists at the low price of $2,950. It is practically a miniature edition of the larger cabin monoplanes popularized in this country

Today at *Detroit*

Above — The all-metal "Flamingo," while not new to the industry, has been enlarged considerably. Its unusual use of sheet dural lends the plane well to low cost and quantity production

Right — The Doyle "Oriole" is one of the smallest ships at the show. Parasol monoplanes are not frequently found at aircraft shows in this country. This new ship is therefore of interest

Below — An unusually low wing loading of 5.5 lb. per sq. ft. is a characteristic of this Trella sport plane. It has a 60 hp. powerplant

commercial biplane. This company manufactures five types of planes, ranging from a light folding wing, two-place biplane to a twin-motored, six-passenger cabin ship.

Another company manufacturing under a foreign license is the Whittelsey Mfg. Co., formerly the Whittelsey Body Co., of Bridgeport, Conn., who have the American rights to the Avro ships. An Avro Avian will be exhibited at Detroit.

Built as a result of over 3,000,000 miles of commercial flying, unusual interest attaches itself to the Boeing "95," mail-express-cargo plane, to be shown at Detroit, although the ship in itself is not new, being in use on the transcontinental air mail route operated by the Boeing Air Transport, Inc. With a payload of 1610 lb., the ship has a maximum speed of 142 m.p.h., a take-off of under 12 sec., equivalent to 525 ft. in still air, and a landing speed of 57 m.p.h. The powerplant is a Pratt & Whitney Hornet, giving a power loading of 11.1 lb. per hp. The wing loading is 11.9 lb. per sq. ft. Special features are: A hand brake for locking wheel brakes that is independent from the rudder pedal-operated brake controls, retractable landing light, a cockpit heating system, tail surfaces and ailerons of all-metal construction, steerable oleo tail skid, safety glass windshield, and a vertically adjustable driver's seat.

Intense interest is being felt this year in seaplane design. The Buhl Aircraft Co. is exhibiting its standard "Airsedan," with J-6 powerplant, equipped with floats. The Buhl company now produces three sizes of closed cabin ships, all sesqui-planes, ranging from the three-passenger sport model with J-5 or J-6 engine, to the Senior Airsedan, an eight-passenger, Hornet-engined ship. All have top speeds in excess of 140 m.p.h., it is stated.

In addition to the amphibian landing gear to be shown on the Vought Corsair, it will be fitted also with Handley-Paige slotted wings. A number of those ships recently were shipped by the Chance-Vought company to the Mexican government for use in suppressing the revolution.

Universal motor mounts are a characteristic of the Commandaire planes, one of which will be shown with a Warner engine, and one with an Axelson 150-hp. powerplant. An entirely new plane called the "Oriole" is being produced by the Doyle Aero Corp. of Baltimore. It is a two-place parasol ship fitted with a LeBlond 60-hp. engine. The cabane structure of this ship is welded directly to the fuselage, being designed to carry the full airplane load in case of a nose over. A top speed of 103 m.p.h. is claimed. Dual controls are standard equipment. A 500 lb. useful load and a 780-lb. weight empty indicates a power loading of 19.7, and a wing loading of 7.7 lb. per sq. ft.

Derived from the Glenn L. Martin 74, a three-purpose Navy plane, the Hornet-engined "Miss Great Lakes," is the Great Lakes Aircraft Corporation's first commercial ship. It has a six-passenger cabin, a cruising speed of 110 m.p.h., and weighs 3500 lb. empty, as a commercial ship. According to Benjamin F. Castle, newly-elected president of the Great Lakes company, a complete line of commercial ships, ranging from light training planes to the largest air liners, are being projected for production.

The corporation is now in the field with a light training and sports plane known as Model 2T-1, which will be exhibited at the show. It is a two-place open job with dual controls, built of duralumin and powered by a 95-hp. Cirrus four-in-line air-cooled motor. Its span is 26 ft. 8 in., its length 20 ft. and the height 7 ft. 11 in. It is described as having a high speed of 115 m.p.h., a cruising speed of 95 m.p.h. and a landing speed of 40 m.p.h. The fuselage and all surfaces are fabric-covered.

A new plane will be exhibited by the Keystone Aircraft Corp. At the time of writing, the ship had not been completed. A combination of a number of foreign and American design features are found in the KN-1 four-place biplane, designed by Felix W. A. Knoll, president of the Knoll Aircraft Corp., and formerly with the Rohrbach and Heinkle companies in Germany. In general design, it is a thick-wing, single bay biplane, powered with a Wright J-5 engine, or a powerplant of similar horsepower. The lower wing, with its 28.5 ft.

span, has a 4-deg. dihedral, while the upper, 33.5 ft. wing leads the lower with a 2 ft. 8-in. stagger. With a gross weight of 3050 lb., the wing loading is slightly more than 11 lb. per sq. ft. Ailerons are of the Lachmann type. The wings have a plywood covering, while fabric is used for the most part on the steel tube fuselage. The four to six-passenger cabin has three doors. The fuel tanks are exceptionally large, holding 142 gal. and providing a cruising range of nearly 1200 miles.

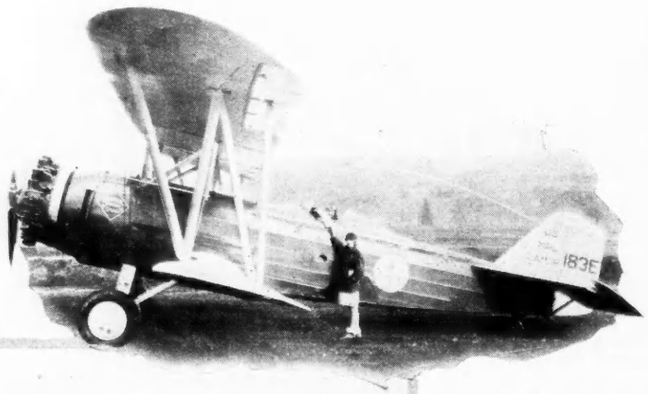
A new two-place training and sport plane will be exhibited by the Lincoln Aircraft Co. It is adaptable to motors of around 80 to 110 hp., a top speed of 100 m.p.h., a landing speed said to be less than 30 m.p.h.. and lists at $1,985, less motor and propeller. The construction is conventional with high safety factors.

First public presentation of its new B-5 six-place cabin monoplane will be made by the Mahoney-Ryan Aircraft Corp. at the Detroit Show. It is powered with the 300 hp. Wright J-6, with which it is said to have shown a top speed of 140 m.p.h. A feature of the control system is the complete concealing of all cables and torque rods, only the stick and rudder pedals being visible. Brake pedals are independent of the rudder pedals, being operated with the heel while the rudder is operated by the ball of the foot. The crank for the Eclipse inertia starter is located within the cabin, and is supplemented by a booster magneto. Other features are an adjustable stabilizer, plywood covering for the leading edge, tie rod instead of wire drag bracing; hermetically sealed, internally rust-proofed, chrome-molybdenum steel tubing for the fuselage, aerol shock absorbing landing gear struts, full width seats upholstered in plush, de luxe interior finish and triplex glass windows that are crank-operated. The baggage compartment is built further forward than formerly to provide better balance.

The Metal Aircraft Corp., of Cincinnati, which last year exhibited its first "Flamingo" all-metal monoplane, this year will show a later development whose chief departures are an increase in span to 50 ft., a somewhat longer tail, and a decidedly roomier cabin. The ship will be remembered for its unusual use of metal designed to bring down the cost to that comparable with composite construction. The metal skin does not take the drag stress, in this respect being similar to fabric covering, although, of course, of considerably greater safety factor for the ship as a whole. Eight Hornet or Wasp engines are fitted, giving a landing speed of 50 m.p.h., and top speeds of 135 and 140 m.p.h., respectively.

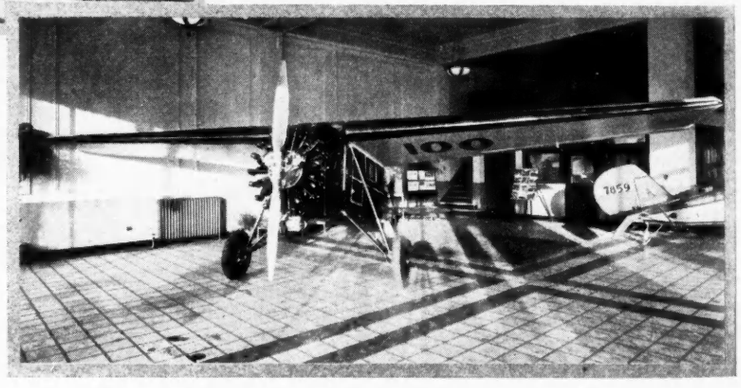
The New Standard Aircraft Corp. of Paterson, N. J., will exhibit its J-5 powered commercial plane. The optional pay load is 930 lb., with a top speed of 125 m.p.h. An unusual feature is the riveted duralumin fuselage and low wing loading of less than 10 lb. per sq. ft. The ship can be had in the five-place, three-place and mail, or all-mail types. It is a single bay biplane of conventional appearance. The faired-in exhaust collector is in three sections in the J-5 installation.

Another new plane is the New Day Barling NB-3, a low winged three-place monoplane, exhibited by Nicholas Beazley Airplane Co., Inc., of Marshall, Mo. Powered with a 60 hp. LeBlond engine, the ship weighs only 690 lb., permitting a useful load of 613 lb., which is unusually high for a ship that small. The low weight is said to be due to the patented wing construction, in which a U box is used in place of the usual two-beam construction. Eighty



Right — All-metal control surfaces are a feature of the Boeing "95" on which a number of improvements learnt from transport operation on a large scale, are incorporated

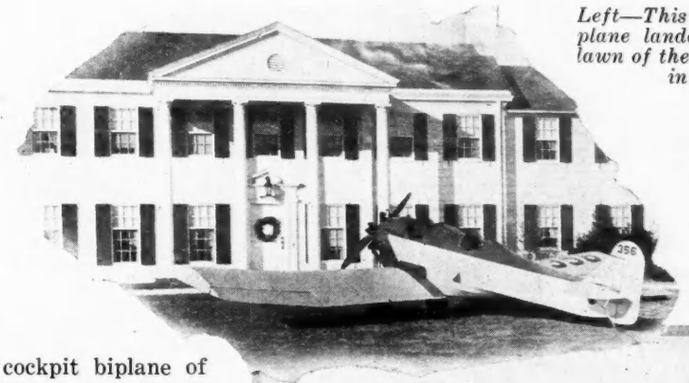
Above—A number of American airplane companies have taken licenses from foreign producers. This Savoia Marchetti is a product of the American Aeronautical Corp.



Right—Full cantilever wings, while found on the larger transports, have not been used frequently on smaller cabin planes, as on this four-place American Eagle "Imperial"

per cent of wing construction is said to be manufactured by machine operation, lending itself well as a result to mass production. Top speed is said to be 105 m.p.h. The price complete is $3,600.

The first public showing by Parks Aircraft, Inc., of its general purpose training ship will be at the Detroit Show. It is a three-place open cockpit biplane of fairly conventional design, powered in the 150 hp. range. Special attention to sturdiness of landing gear, which is of the split axle type, is a feature. Ignition coil firing for starting and an electric gasoline gage are among the instruments included as standard equipment.



Left—This Barling NB-3 monoplane landed and took off on the lawn of the home of Ralph Duggins in Marshall, Mo.

Below — This new Lincoln-Page trainer follows the characteristic lines of this company's products. It is designed for an 80-100 hp. powerplant

Below—The Mahoney-Ryan Aircraft Corp. will introduce its latest cabin monoplane at the Detroit Show. Accessibility of controls and their concealment are a special feature

Conversion of the Super-Mailwing into a passenger ship by elimination of the mail compartment is noted in the list of exhibits scheduled by Pitcairn Aircraft, Inc. This change produces a three-passenger, open cockpit ship of high reliability factor and excellent performance. The latter is further increased through the adoption of the latest N.A.C.A. cowling for the J-5 or J-6 engine.

Another three-place, open cockpit ship will be shown for the first time by R. A. Rearwin, of Salina, Kan. It is called the Ken-Royce. The ship has an exceptionally attractive finish. It is of conventional structural design with a wooden wing and a steel tube fuselage, and with a plywood covering for the wing over and under the centrally located gas tank. The stabilized fin is welded directly to the fuselage. The Curtiss Challenger 170 hp. engine provides a stated top speed of 135 m.p.h. The pay load is 320 lb.

A new edition of the Stinson Junior, four-passenger cabin monoplane, now called the SM-2A, will be exhibited along with the six and eight-passenger cabin types by the Stinson Aircraft Corp. This ship will be shown with the Curtiss Challenger 170-hp. engine as its powerplant, although powerplants ranging from the 110 hp. Warner to the seven-cylinder, 225 hp. Wright J-6 are suitable. This company recently moved its manufacturing facilities from Northville to Wayne, Mich., enabling it to increase its manufacturing operations and giving it access to an airport adjacent to the factory.

St. Louis, Mo., is represented by another new company, the St. Louis Aircraft Co., which will exhibit its "Cardinal," a high-wing, two-passenger, cabin monoplane for individual ownership, powered with the 65 hp. LeBlond engine and priced at $2,950 complete. This company is a subsidiary of the St. Louis Car Co., builders of steam and electric railroad equipment. During the war, the St. Louis Car Co. built JND planes for the government, so it is not strictly new in the airplane field. The "Cardinal" is said to have a top speed of 105 m.p.h., is equipped with internal expanding brakes, adjustable stabilizer, and a micarta tail skid. It has a disposable load of 600 lb., giving it a gross weight of 1425 lb., a wing loading of less than 9 lb. per sq. ft., and a landing speed of 35 m.p.h., it is stated. The power loading is 21.9 lb. per hp. Its dual rudder controls and central joy stick mounting, make it possible for the ship to be flown by either occupant.

Three planes will be shown by the Swift Aircraft Corp., a two-place, sport biplane with a 150-hp. Wright engine, another with a 100-hp. Kinner motor, and a two-place training plane, Ox powered, but requiring only about 80 hp. A new Detroit company that will be represented at the All-American Aircraft Show is Trella Aircraft, which will exhibit a 60-80 hp. two-place, sport biplane. Structurally, the ship is conventional. The controls are installed in both cockpits. The landing gear is of the split axle type. The wing loading is exceptionally low, being 5.5 lb. per sq. ft., although a top speed of 110 m.p.h. is claimed with a LeBlond 60 engine. The power loading is 17.5 lb. per hp.

Several aeronautical groups and organizations will hold meetings in Detroit during show week.

Marine and Airplane Engines Show Interesting *Production Increases*

Steady but less spectacular growth indicated in stock motor field by figures from Bureau of the Census. Diesels register steady rise in output record.

By EDMUND B. NEIL

RECENT releases of figures by the Census Bureau definitely confirm many of the statements made concerning the growth of several branches of the engine manufacturing industry and indicates what may be expected in the near future.

Of outstanding interest is the numerical growth of the small outboard engine, the design of which was briefly reviewed in the Feb. 2 issue, when the increased production of these types was mentioned. If this rate of increase continues throughout this year, it seems entirely possible that the number made in 1929 will be close to 60,000 or more.

The growth of marine engine production in the larger permanently attached types has been no less worthy of attention. These types from 1925 to 1927 increased from 12,890 to 21,360 and should run close to 30,000 for 1929, although it may be noted that in this field growth is not likely to be quite so rapid.

The numbers and value of motor vehicle engines made by those companies specializing in their manufacture, as distinguished from the automobile companies which make their own engines, shows a steady but less spectacular increase since 1925, even though the year 1923 exceeded 1927 in the number made but not their value. Despite decreased production in 1927, an increase of over 20,000 is shown, and, with the adoption of American makes of engines by European manufacturers and the tendency of some vehicle makers to purchase their engines from outside sources, later figures should show still further increases over those for the low year of 1927.

With the disposal of wartime aircraft engine production, the growth of engine manufacture in this field has shown the expected increase. While prior to 1927 the value of airplane engine output was but little more than a few thousand dollars, subsequently obtained statistics indicate that it now ranks in the millions.

A steady growth in farm tractors and a continued demand for farm engines (included under "other types" in table), may be noted.

Growth of Engine Industry

(From Data by Bureau of the Census, U. S. Dept. of Commerce)

ENGINES CLASSIFIED AS TO TYPE	1921		1923		1925		1927	
	Number	Value	Number	Value	Number	Value	Number	Value
MARINE (*)								
Permanently mounted	19,237	$7,603,651	35,092	$8,429,834	12,886	$8,429,707	21,361	$7,411,840
Detachable or outboard					24,628	2,203,932	43,987	$5,224,287
MOTOR VEHICLE (x)	159,592	$31,005,352	385,145	$59,074,243 (3)	304,091	$55,612,881	324,858	$63,635,746
DIESEL AND SEMI-DIESEL								
Marine	330	$8,273,359	1006	$13,487,383	1,105	$6,760,933	1,007	$7,061,862
Other than Marine	All Diesels		All Diesels		2,996	$15,218,684	2,178	$13,225,695
AIRCRAFT (x)	Included with other types. Value for 1925 given as $10,998 for those made in engine industry.						1,397	$9,475,603
TRACTOR								
Farm, Road, etc.	74,366 (1)	$53,168,819 (1)	140,157	$76,426,408	164,097	$100,333,389	195,693	$135,719,817
Garden					4,123	$515,302	6,347	$895,351
Others						$1,462,139	553	$2,172,267
OTHER TYPES		$27,816,559 (2)		$29,172,683	202,159	$26,637,641	185,037	$32,551,895

x—Not including engines made in automobile or aircraft factories, i.e., "stock engines" only.
*—Gasoline type—Not including Diesels.
1—Includes steam tractors (value about $2,500,000).
2—Includes motorcycle and aviation engines.
3—Includes motorcycle and aviation engines (a small number).

Values for 1925 and 1927 and Diesel value for 1923 will be increased slightly if values for engines "not classified as to size" are added, but not sufficiently so to affect indicated trend of growth, except in one case, i. e., value of all marine Diesel engines was slightly greater in 1925 than in 1927. This is also reflected in decreased number built in 1927 (shown in classified group above).

Further details concerning above figures available upon request from Research Dept., Automotive Industries.

Just Among Ourselves

Somebody's Always Cleaning Up Old Stocks

SOMEBODY'S always cleaning up! That is the reason that the retail passenger car market always is in something of a turmoil through cut prices or inside trading discounts. That is the reason that some dealers are overtrading all the time, even though any given individual dealer may overtrade or cut prices (which is the same thing) only occasionally. The effects of cleaning up old stocks are usually beneficial or at least necessary on the part of the individual factory or dealer; but they tend to upset the retail market for competitive makes. And because somebody always is cleaning up, each dealer is likely to be the victim of the process ten times for the once that he is the beneficiary. The only permanent alleviation which seems likely is through continued advances in soundness and intelligence of sales and production planning at the factories. There will be much conversation in the future as in the past about agreements, abuses and regulations, but the financial and economic necessity for better planning and coordination of production with sales probably is the only thing that will bring about definite betterment in conditions in the long run. Progress has already been made by a number of manufacturers; the end of the road is not yet.

* * *

Write Your Own Headline for This . . .

WE have a time bomb waiting to mail special delivery to the first humorist who announces that, in the current hectic stock market, automotive securities "fa down and go boom." . . . . It begins to look, as a matter of fact, as though they were just as likely to "fa down and go bounce!"

Big Events Focus Thought on Export Methods

WE mentioned last week the trend toward manufacture abroad of more and more parts for American-designed cars to be sold in foreign markets. Attention is focused on the possibilities in this direction by such outstanding moves as the purchase by General Motors of Vauxhall and Opel and the reorganization of the Ford European activities which has been going forward in recent months. As a matter of fact, these events which made the newspaper headlines possible are less significant of the decided trend in this direction than a multitude of small modifications in procedure which have been and are being made day by day and month by month.

* * *

Small Changes Continue Steadily

THE big problem of any American manufacturer selling abroad, of course, is to get down the retail sales price of his vehicle. Determination of what parts are to be made abroad means very detailed study and examination of such matters as tariffs, transportation costs, materials prices and local supply sources in connection with each individual item. Such studies doubtless have been in progress by the American makers with foreign assembly plants for some time. First one item, then another profitably is being studied. So gradual has been the change in manufacturing base that it has scarcely been noticeable to the average executive at home unless he is directly connected with just what is going on. If the exact present status of the situation were to be presented quantitatively, most of us probably would be surprised at the development which already has taken place—at least that's our guess.

Measuring Management by Yardstick—Maybe

WELL, it looks as though the executive as well as the machine operator were going to have the results of his efforts judged by a standardized yardstick, if the endeavors of L. P. Alford, vice-president of the American Engineering Council, and J. E. Hannum, finally come to anything. These two men have been working to establish some basis of measuring management efficiency and have hit upon the idea comparing the number of 1000 manhours (k.m.h.) worked in a plant with earnings, capital invested and numerous other factors separately. Then, as we understand it, they hope to find some way of correlating the ratios thus established into a formula for determining management efficiency. Since *Automotive Industries* carried a digest of Mr. Alford's original public presentation of this idea some weeks ago and since K. W. Stillman sets himself to clarifying it in specifically automotive terms on other pages of this issue, we will leave off trying to explain the proposition in our own befuddled way lest we simply roil waters already none to clear. We are trying to get actively interested in the idea, because it seems to us to be as worthy as it is pretentious in its objectives. So far we haven't been able to get past being skeptical about the practical possibilities. It looks like one of those things that couldn't be done; consequently, it seems to us to be well worth the effort expended in trying to do it. Already some powerful and practical industrial leaders are actively interested in its possibilities and it should serve to direct managerial thought along lines which need detailed study, whether its final aim ever is achieved or not.—N.G.S.

THE FORUM

Automobile *Price Reductions* Abroad Possible, *Says Percy Owen*

American cars said to be sold in many foreign markets for sums larger than are justified by the addition of duty and landing and other charges.

Editor, AUTOMOTIVE INDUSTRIES:

A confirmed believer in the desirability of American-built light cars at a low price for sale overseas, and also firmly believing that, due to increasing traffic, a small car is an economic necessity in this country, I was particularly interested in the articles appearing in *Automotive Industries* in connection with the paper prepared by Mr. Mooney and read at the meeting of the Society of Automotive Engineers at Detroit, and in your editorial comment. I am interested in drawing to your attention some additional facts, and in commenting on matters which I believe may be of interest to you as a writer and publisher.

When associated with the Department of Commerce at Washington, because of the reports of enlarging production and increased exports of small cars by European manufacturers, I urged the desirability of investigating the activities and developments of European manufacturers, believing that American automotive manufacturers were not fully alive to the new conditions, and that an investigation in Europe would develop facts of extreme interest and importance to the forward-looking motor car executive. Delegated by the Department to make the investigation, I visited over thirty automotive manufacturing plants in nine different countries. As a Government official, I was able to secure, from inside sources, information of developments and plans not made available to trade representatives, and of a startling nature. The situation was brought to the attention of our American manufacturers through a series of articles prepared by me in "Commerce Reports" early in 1925, and by word of mouth to our American manufacturers in meetings and privately.

Mr. Mooney's story is interesting. I believe, however, there are other facts of very serious import, which have not been brought to light in the discussion. For instance, American cars are in many markets abroad sold at prices much greater than are actually justified when American prices and actual landing costs, duties, etc., are considered. I believe there is still a very considerable opportunity for American manufacturers to further increase the sales of their cars abroad by assuring themselves that their cars are retailed at fair prices in foreign markets. Every dollar that can come off this foreign list price means additional sales. In this respect the situation is the same as it is in this country, but more so. Here a reduction in list price of $25 even is heralded in large advertising spreads. Why not follow the same practice abroad?

Too often the American manufacturer loses sight of the fact that the earning power of the foreigner is very much less than the earning power of an individual in this country, and his buying power and his urge to buy, through force of circumstances and by century-old habits, are very much less. Particularly is this true in the larger masses of population.

The *"cost"* of a motor car includes, not only the *purchase* price, but the *cost of operation*:—taxes, fuel, repairs, etc. Consider gasoline cost. In Detroit a common laborer receives for one hour's work the equivalent of three gallons of gasoline. Consider the amount of gasoline that a foreign workman can purchase with the amount which he receives for one hour's work. In arriving at this figure, due consideration must be paid, not only to the *very low wage he receives* for his labor, but the *very high price he must pay* for his gasoline.

During my activities in Washington, endeavoring to increase the sales and use of American motor cars abroad, I made a particular study of the retail price of gasoline in the various markets of the world. It was astounding to find the exorbiant prices which the foreigner had to pay for gasoline when American selling prices plus landed costs were taken into consideration.

It seemed to me, at the time, if the large American oil companies could be interested in a movement to establish *fair prices* for gasoline in the world markets, their sales volume would be greatly increased and that the use of motor cars abroad would be very considerably greater. I considered that it would be possible to gather in Washington a group of the representatives of these companies to meet with Mr. Hoover, to whom American manufacturers have always been ready to listen, and have him present the situation and supplement his remarks, if necessary, by comments of those of us who had made a particular study of the situation. I felt Mr. Hoover's influence would go a long way in remedying the situation and that the oil men would be entirely cooperative. I brought this matter to the attention of leading men in the automotive industry but received little encouragement.

It has been said, "An old fire horse retired from active fire service pricks up his ears at the sound of the fire bells and whistles and, unless tied, is prone to dash after the engines." While not directly connected with motor car manufacture and sales, my interest in increasing the sales of our automotive products abroad is still very great. I have believed for years that America, and for many reasons, must be the "work-shop of the world" in the production of the world's motor cars. I also believe, notwithstanding the most interesting figures which are published respecting the growth in sales of American automotive products abroad, that still greater sales are possible abroad if our manufacturers will really interest themselves in meeting the conditions which exist and will continue to exist in foreign countries, and which conditions are very materially different from those which exist in this country.

I believe that conditions are fast approaching, in fact are already here, which make a similar type car desirable for this country, and for very different reasons. Some manufacturers have recognized the possibilities and are reaping the rewards rightfully theirs. Our city streets jammed with traffic of large cars demand the use of smaller cars. Parking space is also limited. Our main country highways are permanently surfaced, and every year more and more are being permanently improved. The necessity of the large high-powered car is growing less and less. Let us have good small low-priced cars and more of them. They will sell abroad. There is a demand here.—PERCY OWEN, *President, Associated Management; formerly, chief, automotive division, Bureau of Foreign and Domestic Commerce.*

Oil Engine Terminology

Editor, AUTOMOTIVE INDUSTRIES:

For some years now Robertson Matthews has been voicing his opinion about the need of an oil engine terminology, most recently in your issue of Feb. 2.

Engines have been burning oil for some time, and according to another article in the same issue of *Automotive Industries,* bus engines are now beginning it as well, without having a remotest kinship to the original Diesel engine.

As Mr. Matthews says, Diesel is a very convenient name used for all sorts of oil-burning engines with compression-ignition. As far as names go, we have the Buda Diesel, the Attendu, Winton and a great many others, each with its own particular specifications and qualities. So, when somebody mentions the Winton oil engine, everybody in the industry knows what it is all about.

If there is going to be an Oil Engine Terminology Committee of the S. A. E., which may be a good way to settle things, I wish to request that committee to create a name for an engine of the following nature:

Highly supercharged two-stroke-cycle engine with 500 lb. p. sq. in. compression pressure, around 800 lb. p. sq. in. combustion pressure, an open combustion chamber, direct airless injection, 2000 r.p.m., 100 lb. p. sq. in. b.m.e.p., 5 lb. weight per b.hp., 0.45 lb. fuel consumption per b. hp.-hr.

If it is impossible to find a satisfactory substitute for the name Diesel, that name is a very fitting one, in this particular case at least. HUGO MOREN.

Books for the Business Bookshelf

Representative Industries in the United States

Edited by H. T. Warshow, Henry Holt & Co., New York. 702 pp. $5.

THIS book gives for each of a number of the more important industries of the United States a brief history, the conditions surrounding its origin in this country, its relation to American industry as a whole, the growth of its domestic trade, improvements and technological processes, growth of its export business, a discussion of its labor problems, a brief review of large consolidations or combinations and any special developments peculiar to the individual industry. Of particular interest to automotive readers is the section on the automobile industry written by A. R. Erskine, president, Studebaker Corp. of America, and the chapter on Rubber prepared by P. W. Litchfield, president, the Goodyear Tire & Rubber Co. Other industries treated in the book are aluminum, chemical, copper, cotton, electric, iron and steel, leather, lumber, paint, railway, water-power, wool and zinc.

Manufacturing Costs and Accounts

A. Hamilton Church, McGraw-Hill Book Co., Inc., New York. 516 pp. $6.

THIS is a second edition of a volume originally printed in 1927 and which has passed through seven printings since that time. The present volume has been revised considerably and enlarged, but the general plan of the work remains unchanged. The book is divided into three parts, the first having to do with a general outline of manufacturing accounts, the second taking up the details of cost accounting and the third discussing factory reports and returns. The revisions and additions which have been made to the book to bring it up to date should add considerably to its value as a source book of information on manufacturing cost accounting.

Foreman Training

Geo. F. Mellon, McGraw-Hill Book Co., New York. 150 pp. $1.75.

THIS book contains a course on foreman training, prepared for the Department of Engineering Extension of the Pennsylvania State College, where the author is assistant professor of Industrial Engineering. Because of this, the volume is not the work of a single mind, setting forth its theories of the principles and practice of foreman training, but it is the bringing together in connected form of the net results of the entire department's wide experience in foreman training, conducted for over 100 industrial plants. The book deals with the conference methods of foreman training, and considers eight general objectives which may be taught in such a course. These objectives are, general responsibility, production and cost responsibility, cooperation, discipline and morale, interest and satisfaction, handling men, supervision and leadership.

First with the News

Reliable, Accurate

News of the Industry

PAGE 564 VOLUME 60 *Philadelphia, Saturday, April 6, 1929* NUMBER 14

Total Production in March Fixed at 594,000 Vehicles

PHILADELPHIA, April 6—Breaking February's all-time motor vehicle production record by nearly 100,000 units, total car and truck production in the United States and Canada during March totaled 594,000, according to reports from the National Automobile Chamber of Commerce and the Ford Motor Co. N.A.C.C. members produced 412,000 vehicles while the Ford production was about 182,000. This makes a total output for the first quarter of 1929 of 1,514,000 units, over half a million more than were produced during the same period of 1928.

Keeping pace with production, exports have arisen to new heights with January shipments to foreign markets totaling more than 62,000 units. That figure has been exceeded only four times and they were during the latter half of 1928. Partial returns for February indicate foreign sales of 66,700 units. As this figure does not include unreported foreign asemblies, which in January amounted to 13,800 vehicles, it appears that the total of February exports will be nearly 80,000 units, far above the best previous record.

The only uncertain element in the picture is retail sales. January sales totaled 228,000, which, with domestic production available for consumption amounting to 313,000 cars, increased dealer stocks by about 85,000 units. February sales based on complete returns from 35 states apparently are running a little ahead of January with a prospective total of about 275,000 cars sold. Since nearly 375,000 cars were shipped to dealers during that month, stocks were increased, apparently, nearly 100,000 more.

March production of cars for domestic consumption may be estimated at about 440,000 and required unusual sales activities during the month to prevent another increase in dealer stocks. Such an increase is normal, of course, since stocks are usually at their maximum on April 1, but the prospective increase appears to be somewhat greater than conservative judgment would indicate to be desirable.

During the first quarter, about 1,100,000 cars have been shipped to dealers, and during the first two months of the quarter, the dealers disposed of slightly over 500,000 of them. This left them, on April 1, with about 600,000 more cars on hand, less their March sales, than were in stock on Jan. 1. Unless March sales made very considerable increases over January and February and totaled around 400,000 units, dealers now have greater stocks than ever before in history.

February sales appear spotty, particularly in the West and South. New England and Middle Atlantic States sales for February are well ahead of January totals but a considerable number of states so far reported absorbed fewer cars in February than in the month before. Some of the states in which this condition prevails are West Virginia, Illinois, Wisconsin, North and South Dakota, Arkansas, Idaho, Montana, Nevada, New Mexico, Utah, Oregon and Washington—an unusually large number of states to reverse normal trends and report smaller car sales in February than in January.

(Factory Reports Appear on Page 566)

Exports of Casings Show Three Per Cent Decrease

WASHINGTON, April 4—Preliminary figures announced by the Department of Commerce this week place 1928 world exports of automobile casings at 8,633,000 units as compared with 8,836,000 for 1927, a decrease of 203,000 units, or about 3 per cent.

The United States maintained its supremacy last year but suffered a volume decline of 4 per cent. France, Canada and Great Britain suffered volume losses of 14, 1 and 2 per cent, respectively. On the other hand, Belgium increased its exports by 51 per cent, Italy by 25 per cent, Japan by 22 per cent, and Germany by 17 per cent.

Motor Stock Drop Shown in Analysis

NEW YORK, April 3—An analysis of the appraised value of seven representative motors common stocks made by Frazier Jelke & Co., shows that on Feb. 28, 1929, they had a value of $5,179,699,000 represented by 57,737,985 shares. On March 28, 1929, the appraised value was $5,115,390,000 represented by 67,721,956 shares. This is a decrease in the appraised value of $64,309,000. Stocks represented in this grouping are Chrysler, General Motors, Graham-Paige, Mack Trucks, Nash, Packard and Studebaker.

Automobile Industry Causes Export Gain

WASHINGTON, April 4—All postwar records for exports from the United States were broken during the first two months of this year, according to figures for January and February just announced by the Department of Commerce. The increase of 20 per cent over the corresponding period of last year was due primarily to increased automotive exports.

The total exports were $915,600,000, of which $105,400,000 were automobile parts, etc., and $7,000,000 were automobile casings. The January-February automotive exports of this year represented a gain of 59.7 per cent over the same two months of last year. Imports of crude rubber, used primarily by the automobile industry, decreased 10.4 per cent in January-February, compared with same two months of last year.

Continental Shows Gain

DETROIT, April 4 — Continental Motors Corp. increased its business by 18 per cent during the first quarter of 1929, according to W. R. Angell, executive vice-president. This increase does not include new contracts in Ford business, which have been received covering parts on old and new models.

Four Wheel Drive Adds Truck Model

New Vehicle Is Equipped With Six-Cylinder Waukesha Engine

CLINTONVILLE, WIS., April 3—A new six-cylinder, four-wheel-drive truck of two-ton capacity, Model H-6, has been added to the line of the Four Wheel Drive Auto Co. The engine is a Waukesha XL with six 3½ by 4½ in. cylinders. To permit the frame to be mounted low, the oil pan of the engine is designed with the oil sump forward. A Zenith carburetor is fitted, and ignition is by a North-East distributor. Generator and starter also are of North-East make.

Following characteristic FWD design, model H6 has a Brown-Lipe clutch and four-speed transmission mounted in unit with the engine, a sub-transmission placed amidship, and full-floating bevel-gear axles, front and rear. The sub-transmission is hung from the frame at three points. Its assembly includes two sprockets, a chain and a differential, the latter being inside the lower sprocket. A lock is provided to throw this differential out of action.

A single brake drum with 252 sq. in. of braking surface is used as a service brake. This brake is mounted on the upper shaft of the sub-transmission and exerts its braking action on all four wheels of the truck. The hand brake operates on 18 by 3 in. drums on the rear wheels.

Firms in Spain Discuss Subsidized Car Industry

WASHINGTON, April 4—The creation of a government subsidized automobile and truck manufacturing industry in Spain is being seriously discussed by representatives of the automotive industry in that country with the Spanish government, according to reports to the Department of Commerce.

Tentative plans, already approved, provide for a five per cent guaranty on returns and the creation of a corporation with 100,000,000 pesetas backing. The automobile companies Hispano Suiza, Ricart and Euskalduna are prime movers in the plan. A production of 20,000 units of low, medium and high priced cars and trucks is planned for the first year.

Boeing Plans Alaskan Line

SEATTLE, April 2—Officials of the Boeing system announce that a regular passenger flying service to Alaska is to be inaugurated soon, making it possible for a traveler to come via Boeing lines from Los Angeles to Seattle by airplane and thence by seaplane to southeastern Alaska, one of the longest combination water and land plane trips in the world. The six-passenger seaplanes which will be placed on the Alaska flight can take off after a run of 900 ft. and are powered by 425 hp. Pratt & Whitney "Wasp" engines.

Court Rules State May Not Tax Bassett Estate

DETROIT, April 3—In an opinion handed down by the Michigan State Supreme Court, the State of Michigan has no right to collect an inheritance tax on the property of the late Harry J. Bassett, president of the Buick Motor Co., transferred to the Genesee Corp. before his death, in 1926.

Mr. Bassett transferred to the holding company before his death 4800 shares of Managers Securities Corp. stock. The Genesee County Court ruled against assessing this property and collecting inheritance tax and the state appealed to the Supreme Court.

Second Quarter Will Be Better, Erskine Believes

NEW YORK, April 2—A. R. Erskine, president of the Studebaker Corp. of America, announced at a directors' meeting yesterday that the corporation had the most profitable first quarter for the past five years and that earnings on the common stock outstanding would probably reach $2.30 per share, as compared with $2.05 per share for the corresponding quarter of 1928.

He predicted that the second quarter would excel the first quarter of this year in the volume of business written and establish a new record for the Studebaker corporation.

Trygve Jolstad

DETROIT, April 2—Trygve Jolstad, 43, assistant general manager of the Briggs Mfg. Co., died March 31. He was a graduate of the Engineering College, Horten, Norway, and came to Detroit in 1907. In 1909 he joined the American Car & Foundry Co. in St. Louis, Mo., and came to the Detroit branch in 1915. A year later he became associated with the Michigan Stamping Co. where he was factory manager until this company was absorbed by the Briggs Mfg. Co. four years ago.

Wright Reelects Board

NEW YORK, April 3—Stockholders of the Wright Aeronautical Corp. reelected their board of directors at the annual meeting yesterday and approved an increase in capital stock of from 500,000 to 1,500,000 shares.

Andrew Wallberg

DETROIT, April 3—Andrew Wallberg, 61 years old, engineer and industrialist, Battle Creek, Mich., who was associated with the Toronto-Durant Co., died at Toronto, March 30.

Fairchild Expands Office

NEW YORK, April 2—The Fairchild Aviation Corp. has doubled its office floor space by leasing the 47th floor of the Chanin building here.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES.

NEW YORK, April 4—The mild weather during the last week has been favorable to trade and outdoor operations. Industrial activity in general is continuing at a good rate. The swollen rivers in the South have somewhat subsided, but there is still much anxiety existing in trade in the affected districts.

OIL PRODUCTION

The average daily crude oil production for the week ended March 23 was 2,655,600 barrels, which marks an increase of 30,450 barrels over that for the preceding week.

FREIGHT CAR LOADINGS

Car loadings for the week ended March 16 totaled 957,460 cars, which marks an increase of 11,690 cars above those in the preceding week and 14,888 cars above those in the corresponding week last year.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended March 30 stood at 98.3, which compares with 98.3 the week before and 98.2 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City for the week ended March 27 were 13 per cent above those in the corresponding week last year.

STOCK MARKET

During the early part of last week the stock market suffered one of the most severe crashes in its history, and many new lows for the year were reached. The crash was brought about by a further tightening of money, which drove the call money rate up to 20 per cent. However, the credit situation was relieved during the latter part of the week; and, with call money at 8 per cent, a recovery equally as pronounced as the recession took place. The net changes in prices for the week were slight. Brokers' loans in New York City for the week ended March 27 decreased $144,000,000. This is a much smaller decrease than was generally expected and is not regarded as very impressive in the face of the $166,000,000 increase the preceding week.

FEDERAL RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended March 27 showed an increase of $81,400,000 in holdings of discounted bills, while there were decreases of $28,400,000 in holdings of bills bought in the open market, of $15,000,000 in holdings of Government securities, and of $7,400,000 in member bank reserve deposits. The Reserve ratio on March 27 was 71.3 per cent, which compares with 71.7 per cent a week earlier.

Durant Names Cole as Chief Engineer

Company Establishes Research Work in Detroit; Moves Several Executives

DETROIT, April 3—Roy E. Cole, until recently chief engineer of Dodge Brothers Corp., has been named chief engineer of Durant Motors, Inc. Engineering research laboratories of the company have been established at 16th St. and Merrick Ave., in a building formerly occupied by the Gemmer Mfg. Co. Already several executives of the Durant engineering staff have been transferred to the new headquarters from Elizabeth.

Mr. Cole, who is a graduate of Ohio State University, has been doing engineering work in Detroit for more than 18 years, during which he was with Continental Motors, Chalmers and, for the last five years, with Dodge Brothers. The Durant company also has announced the appointment of Harold Nutt as assistant chief engineer. Mr. Nutt was for seven years with the Durant organization at Elizabeth, coming from the Premier Motor Co. of Indianapolis.

Carl M. Philips, Durant body engineer, has established his office in Detroit, and George H. Robinson, in charge of experimental work and tests, also has been transferred from Elizabeth to this city.

Mengel Buys Steam Plant to Furnish Own Current

LOUISVILLE, KY., April 2—The Mengel Co., automotive body parts manufacturer of Louisville, recently placed contracts with Westinghouse for a 2000 kw. steam generator plant, of the turbine type, plus switch board, etc., for its 12th and Dumesnil plant, and is also constructing a new steam plant at the Fourth street operation, which will be of similar size. Heretofore the company has been buying current.

It is reported that the company is operating the Dumesnil plant as well as the much enlarged Fourth street plant at capacity, and now has production up to a point where about 15,000,000 ft. of hardwoods is being consumed monthly in the two operations. Reports issued by the company show more business in hand at the present time than at any previous time in its history.

Orders Stamping Presses

TOLEDO, April 3—The City Auto Stamping Co. has let a contract to the Toledo Machine & Tool Co., for a large order of heavy presses for its new plant under construction. The stamping company is investing more than $900,000 in plant and equipment and will produce heavy stampings for the automotive trade.

Production and Shipments in March

Ford Motor Co. produced 181,894 cars and trucks in March, compared with 159,011 in February. These figures include Canadian and overseas production. To date 1,359,353 Model A cars have been made, of which 1,122,836 were domestic, 126,460 export, and 110,057 by Ford Motor Co. of Canada, Ltd. The Canadian company produced 13,251 cars in March, bringing its production for the first quarter to 36,251.

Chevrolet Motor Co. broke all monthly production records in March with an output of 147,274 cars and trucks, compared with 121,249 cars and trucks in February and 133,657 units in March, 1928. The best previous month in the company's history was May, 1928, when output was 140,775 cars and trucks. Total output for the quarter just ended was 354,701 cars and trucks, compared with 342,184 units in the corresponding period last year.

Durant Motors, Inc., announces that 5876 units were produced in its Lansing and Elizabeth plants in March, compared with 2745 in February and 1549 in January. The Canadian factory turned out 2875 cars and trucks in March, compared with 1715 in February and 1504 in January. The company's California plants shipped 2330 units in March, 1533 in February and 920 in January.

Franklin Automobile Co. announces production and shipments for March as 1566 units, completing the heaviest first quarter shipments in the history of the company, 131 per cent ahead of the first quarter last year and 255 cars ahead of the first half of 1928. March shipments exceeded any previous month in the company's history, showing a gain of 140 per cent over March, 1928.

Cadillac Motor Car Co. announces shipments of 4009 Cadillac and LaSalle cars in March, a 10 per cent increase over February. The company entered April with a considerable quantity of unfilled orders. Deliveries are running ahead of last year, according to President Fisher.

Nash Motors Co. announces shipment in March as 15,384, a gain of 44 per cent over March of last year. In the first four months of the fiscal year, beginning Dec. 1, 1928, production reached 43,011 units, against 29,721 in the same period a year ago.

Willys-Overland, Inc., reports production in March as 35,000 cars, compared with 33,000 in February and 32,000 in March, 1928. The April schedule calls for 36,000 cars, against 38,000 last year.

Packard Motor Car Co. announces March production as 4780 cars, compared with 4390 in February and 4699 in March, 1928. Production in the first quarter totaled 14,078 cars, against 13,098 in the corresponding period last year.

Graham-Paige Motors Corp. reports its March production as 9610 cars, making the total for the first quarter 25,284. Production this year reached 21,880 on March 20, equaling production for the entire year of 1927.

Hudson Motor Car Co. has entered April with a production schedule of 45,000 cars. The company produced 44,295 units in March, making shipments for the first quarter 108,298. It is announced that retail sales are at a higher rate than cars are being turned out, although the plant has been operating at full capacity since mid-February.

Studebaker Corp. of America reports that production of the Commander Eight has reached a new high record of 200 cars daily. The schedule of this model for April has been increased to 250 units per day. All of the company's export manufacture is now concentrated for the first time at South Bend. Overseas shipments have reached a new high for the year of 70 cars a day.

Pierce-Arrow Motor Car Co. announces that it has entered April with 2500 unfilled orders on hand and with production, rather than sales, as its immediate problem. For April 1500 cars are scheduled for production compared with 600 in April, 1928. Sales for the first quarter were 2000 units, against 1200 in the same period last year. Directors of the company have been reelected.

Marmon Motor Car Co. announces shipments of Marmon and Roosevelt cars in March as 3604 units, approximately 40 per cent greater than the best previous month in the company's history. Daily production during the last 13 days of March averaged 206 units. The production schedule for both cars in April is 6500 units. The popular reception accorded the Roosevelt in its first national showing, March 30 and 31, may necessitate further increase in April production schedule.

Auburn Automobile Co. has entered April with a production schedule of 3500 cars. March sales were 2329 cars. Sales for the first four months of the fiscal year were 6987, compared with 4322 cars in the corresponding period last year. Maximum production at the Connersville plant is expected very soon.

Reo Motor Car Co. announces shipments of 4611 Flying Clouds and Speedwagons in March, compared with 3539 in March, 1928, establishing a new record for the month of March. The company announces more than 5600 unfilled orders with stocks of distributors and dealers at an exceptionally low level for this time of the year.

Olds Motor Works has a tentative schedule of 15,000 cars for April. March production exceeded 13,000 units, which was 4000 more than were built in March, 1928, a gain of 44 per cent. The company shipped 16,000 more cars during the quarter just ended than in the corresponding period last year.

Buick Motor Co. reports March production as 15,206 cars. According to A. H. Sarvis, assistant general sales manager, Buick new car stocks in the field are very satisfactory. Retail demand has increased.

Peerless Motor Car Co. reports March shipments as 1107, compared with 881 in March, 1928. Shipments for the first quarter this year were 3689, compared with 2091 in the corresponding period last year.

Canadian Chevrolet Expands Production

Now Makes All Cars for New Zealand, Spain and Egypt

OSHAWA, ONT., April 2—Beginning yesterday, all Chevrolet cars to be exported to New Zealand, Spain and Egypt are being manufactured by the General Motors Co. of Canada, Ltd., according to J. S. Fraser, export and customs manager of the Canadian unit, which has its headquarters in this city. This move was influenced largely, it was said, by the New Zealand preferential tariff, which provides that cars consisting of at least 50 per cent Canadian-made parts may enter that country under a much lower tariff than those made in a country without the British Empire.

The Canadian Chevrolet, nearly 95 per cent of which is made in Canada, falls well within this classification, Mr. Fraser said. The peak sales months for all three of these countries are in the winter months of this hemisphere, January to March. This demand, coming in a season hitherto slack for Canadian General Motors, will cause the local line to operate during October, November and December, when it was formerly almost entirely closed, it was said.

While production here might be as low as 1200 jobs per month during these three fall months, it is likely to run higher, according to Mr. Fraser. The lower price of Chevrolet cars in New Zealand, because of the preferential tariff, is expected to increase their popularity in that country.

New Jersey Cars Increase

NEW YORK, March 30—New car registrations in New Jersey for February totaled 8118 as compared with 7965 for February a year ago, according to Sherlock & Arnold. New car registrations for the year to the end of February totaled 13,181 as compared with 12,299 for the first two months of last year.

Neul Opens Branch

GALESBURG, ILL., April 2—The Neul Mfg. Co., Chicago, has established a factory branch here in which it has begun production of its line of accessories. Louis A. Hoopes, for the last year with the Chicago factory, is in charge. The Galesburg plant, the first to be established outside Chicago, expects to double its present force of eight men in a short time.

Tractor Output Announced

WASHINGTON, April 3—The Department of Commerce has announced that, according to data collected at the annual canvass of manufacturers of farm equipment, the total production of tractors in 1928 amounted to 171,137, valued at $161,461,462. Of this total 152,124, valued at $113,730,502, were of the wheeled type, and 19,013, valued at $47,730,960, were of the track-laying type. Of the tractors sold by manufacturers, 99,491, valued at $98,528,923, were for use in the United States, and 48,806, valued at $42,220,807, were sold for export.

Bureau Estimates Miles of Travel

WASHINGTON, April 4—The motor vehicles of the United States last year traveled a total of 137,000,000,000 miles, according to estimates of the U. S. Bureau of Public Roads, based on gasoline consumption of 10,596,000,000 gallons during the year multiplied by 12.9 representing an average gasoline consumption of 12.9 miles per gallon.

Goodyear Plans to Erect Sixth Mill at Rockmart

AKRON, April 2—To supply cotton fabric, principally for its new tire plant at Gadsen, Ala., the Goodyear Tire and Rubber Co. will establish its third southern unit at Rockmart, Ga., 14 miles from its mill at Cedartown, at a total cost approximating $4,000,000, according to officials. The new mill will be equipped with 50,000 spindles, and it is expected that it will be in production by early fall, employing 1100 persons.

The Goodyear company owns 350 acres in Rockmart, which has a population of 2500, and plans to erect 400 houses for workers. The contracts for the new plant have not yet been awarded, but it is expected that work will be started within a month. This will be Goodyear's sixth cotton mill.

Castings Plant Reopened

BEAVER DAM, WIS., April 1—Western Malleables, Inc., of this city, announces that demands of the automotive industry have made necessary the reopening of its Elm Street foundry with a force of 175 men, increasing the total payroll to nearly 700. While the company's plants formerly specialized in railroad castings, the present business is almost entirely in automotive castings, these being supplied to More than 15 passenger car and truck builders.

Danly Machine Opens Plant

CHICAGO, April 2—Danly Machine Specialties, Inc., pioneer maker of standardized die sets, has recently opened a warehouse and assembly plant at Rochester, New York, in charge of A. F. Wallace. A complete stock of die sets and die makers' supplies is carried.

Slight Lull Marks Car Steel Industry

Mills, Loaded With Orders, Welcome Pause in New Buying

NEW YORK, April 4—It is widely remarked at this time that the steel industry is running on its momentum and will continue to do so throughout April. The heavy volume of specifications received by mills last month was bound to be followed by somewhat of a lull, but sheet and strip mills are so heavily committed for April that the pause in fresh specifying is rather welcomed. Many non-integrated rollers are having some difficulty in obtaining adequate supplies of semi-finished material.

April 1 brought into full effect the $1 per ton advance in semi-finished steel, sheet bars now commanding $35 and billets and slabs $34. In some cases premiums have been offered to obtain sufficiently speedy shipments to prevent interruption of rolling schedules. The strong tone of the semi-finished market now, when seasonal easing off in the demand for finished steel products must be looked for, makes it certain that sheet bar prices will be used as a prop for sheet prices when sheet orders are no longer so numerous and heavy as they have been of late.

Demand for automotive alloy steels is well maintained. Cold-finished steel bars are freely called for. The market for cold-rolled strip-steel is unchanged with mills still hard pressed to satisfy everybody in the matter of rush shipments. Automotive buying of bolts and nuts is continuing on a broad scale. A number of mills are making plans to rearrange their plant set-up when pressure for rush shipments subsides, so as to be able to cope all the more efficiently with demand when it shows again a rising curve.

Pig Iron—Competition among blast furnaces is keen and round tonnage buyers have apparently been able to cover their wants without having to pay the full price advances recently announced. Better than the $18.00 base price for No. 2 foundry is, however, being obtained by Valley furnaces in many single car sales. The Michigan price is unchanged and firm.

Aluminum—Some fairly good-sized tonnages of aluminum have been landed in New York in the last week or so, indicating that importers' warehouse stocks have been worked lower. In Europe, especially in Germany, aluminum producers are capitalizing prevailing high copper prices to broaden the market for the light metal. The European Consortium, however, is mainly concerned in preventing overproduction. Automotive demand for piston metal continues excellent. Remelters report a good supply of scrap. The virgin aluminum market is firm at unchanged price levels.

Copper—A more quiet tone has set in. Wall Street again predicts further hardening of prices on the theory that buyers are slow in taking hold, which may bring about another rush for metal later.

Men of the Industry and What They Are Doing

Mooney Arranges Return For Today, Before Sloan

NEW YORK, April 6—James D. Mooney, vice-president of the General Motors Corp. in charge of overseas operations, recently announced that he would arrive here today on the S. S. Leviathan from Europe where he has been occupied with Alfred P. Sloan, Jr., president, and other General Motors officials in the purchase of a substantial interest in the Adam Opel Co. of Russelsheim, Germany.

Mr. Mooney arranged his return to New York in advance of other officials to conclude plans for the conference of managing directors of all his 23 overseas subsidiary companies, which is to be held at Shawnee-on-Delaware May 22-30. He expressed himself as gratified at the evidence he saw in Europe of continued soundness in the economic structure and of increased prosperity among the working classes.

Nash Receives Syrian Gift

C. W. Nash, president of the Nash Motors Co., recently received a writing desk, a curious piece of Byzantine art, as a gift of N. Boukather, of Beirut, Syria, Nash distributor in Syria and Iraq. The top of the desk is inlaid with minute bits of strange colored woods, requiring five men 62 days to complete. The manufacturer's name is inlaid in mother-of-pearl.

Segrave Explains Handicap

Speaking at a luncheon of the Advertising Club, New York City, the other day Major H. O. D. Segrave, holder of the world's automobile speed record, remarked that when he made his first run at Daytona Beach last month, a pointed metal turtle left in the upholstery of the seat was sticking into him. He covered the mile in 15.56 seconds despite this handicap.

Gilmer Heads New Firm

Ludwell H. Gilmer, founder and chairman of the board of the L. H. Gilmer Co., of Tacony, Philadelphia, has severed his connection with that firm, except as a director, to head the Gilmer Corp. It will have headquarters in Detroit, with factory at Auburn, Ind., where it is planned to start production of endless belts on April 15. Attention will be centered at the start on automobile fan belts and other molded rubber products.

Former Car Men in New Field

F. W. Hohensee, formerly vice-president of General Motors Corp., and vice-president of Durant Motor Co., upon its organization, and J. P. McCarthy, formerly vice-president and factory manager of Durant Motor Co. of New Jersey, have become interested in the Crystal Oil Burner Corp., having its main office in New York City and factory at Newark.

John Storey

President of the Chamber of Manufacturers of New South Wales. The purpose of his visit to this country is outlined on Page 572 of this issue.

Litle to Address S.A.E.

Thomas J. Litle, chief engineer of the Marmon Motor Car Co., will speak on Vibration Control at the Pennsylvania Section meeting of the Society of Automotive Engineers, in Philadelphia on April 10.

Gabriel Names Foukal

The appointment of Anthony Foukal, for the past seven years assistant purchasing agent of the White Motor Co. of Cleveland, as purchasing agent of the Gabriel Snubber Mfg. Co., was announced recently by George H. Ralls, president of the latter concern.

Bechler Makes Address

W. M. Bechler, assistant comptroller of the B. F. Goodrich Co., addressed the Accounting Committee, of the Rubber Association of America, at its meeting recently. He spoke on Forecasting Raw Material Requirements and the Accounting Control of Materials.

Stone Line Changes Hands

J. A. Anderson, former sales, advertising and promotion manager, and C. F. Lyngaas, branch manager, of the Stone Mfg. Co., Chicago, have acquired the Stone rim and wheel parts and tire business and will continue the line under the new name Wheel Parts and Mfg. Co.

Durant Names Kitzmiller Manager of Distribution

Landon M. Kitzmiller becomes manager of distribution of Durant Motors, Inc., according to R. T. Hodgkins, general sales manager. Mr. Kitzmiller has long been associated with many of the men who recently took over executive management of Durant Motors.

He joined the sales department of Dodge Brothers in 1915 and made various advances until he was assistant director of distribution when he left in 1923 to become associated with George Harrison Phelps, Inc., advertising agency, as assistant treasurer.

Fisher Forms Partnership

Admiral Carey T. Grayson and Charles T. Fisher, automobile body manufacturer of Detroit, have formed a new racing partnership, it became known recently. While Admiral Grayson's horses will keep the Salubria Stable name and Mr. Fisher's horses will carry the colors of Dixiana, their interests will be joined under the management of Preston Burch, noted trainer, it was stated. The partnership will begin the season with 16 horses.

Mercedes Names Vogeler

W. R. Vogeler, former export manager and more recently general manager of the old King Car Corp., has been elected president of the Mercedes Benz Co., Inc., 247 Park Avenue. He has more recently been foreign field representative for General Motors in Central Europe and for the past three years vice-president of Mercedes Benz.

Bohn Reelects Officials

Directors were reelected at the recent annual meeting of Bohn Aluminum & Brass Corp. S. D. Denuyl was elected secretary, succeeding A. P. Lauer, who still remains a director. Other officers were reelected. Charles B. Bohn, president, told stockholders that the company's business is running 20 per cent ahead of last year.

Seymour Joins Paramount

B. M. Seymour, formerly New York branch manager in charge of cab, truck and coach activity for General Motors Truck Co., has become national sales manager for the Paramount Cab Mfg. Co., promoting the campaign to extend sales.

Durant Sends Questionnaire

Continuing his attack on the Federal Reserve Board for its credit restriction policy, W. C. Durant has sent a questionnaire to 100 concerns seeking their opinions on whether their securities are selling at too high prices. The replies are to be held in confidence.

Willys-Overland Earns $6,382,357

Income in 1928 is $2.09 a Share Compared with $2.04 in 1927

TOLEDO, April 2—The Willys-Overland Co. reports net profit of $6,382,357 for 1928 after doing a gross business of $187,233,388, making a new high record for total volume, after charges, including depreciation and prepaid expense incident to introduction of 1929 models.

The earnings are equal to $2.09 a share on common stock outstanding Dec. 28 as compared with the net earnings of $6,341,519 after all charges, equivalent to $2.04 a share for 1927. The 1928 operating profit was $9,131,041 before taxes and special charges as compared with $7,331,238 before taxes the previous year.

Last year the company paid out $1,093,869 in dividends to preferred stockholders and $2,372,943 to common shareholders. Late in December 330,459 shares of common stock were issued at $25 a share, and this yielded $6,401,878 for the surplus account, which was increased to $39,589,826. During the year $1,000,000 of bonds were paid off and $774,000 in preferred stock retired.

The statement issued by President John N. Willys shows cash on hand $2,689,065 and time deposits $8,354,320, with total current assets $41,021,406 at the close of 1928 as compared with only $12,286,319 of current liabilities.

In his letter to stockholders Mr. Willys declared that sales during the first quarter of 1929 have shown a gain of 28.5 per cent over the same period last year. He expects total sales for the three months to run 90,000 cars as compared with 70,554 for the first quarter 1927. Sales abroad were 34.5 per cent greater in 1928 than in previous year. The gain for the first quarter of the current year is estimated at 68 per cent over same period last year.

Plant and equipment assets were increased $7,425,121 during 1928. This included the new body plant at Toledo.

G. M. Silent on Report

NEW YORK, April 3—No official statement was made at the office of the General Motors Corp. here today concerning the report credited to the Hungarian Minister of Foreign Affairs to the effect that the corporation had suddenly dropped its proposal to construct an automobile plant at Szedegin.

Michigan Ranks Fifth

WASHINGTON, April 4—Augmented largely by automotive manufacturing and allied industries, the States of Michigan, Ohio, Pennsylvania and New York are included in the seven leading industrial states, which in 1927 did 60.1 per cent of the total industrial manufacturing of the country, according to tabulation of statistics by the Department of Commerce. Michigan was fifth, largely automotive products, manufacturing a total of $4,244,941,000 finished products in 1927.

Graham-Paige Earnings in 1928 Are $1,055,678

DETROIT, April 1—Graham-Paige Motors Corp. reports net profits of $1,055,678 for 1928, which covers the first full year's operations of the company under the new management headed by the three Graham brothers, as against a loss of $4,643,351.06 for the preceding year, before the introduction of the completely new line of motor cars bearing the name Graham-Paige.

During the year ending Dec. 31, 1928, the report states, 72,956 Graham-Paige motor cars were marketed, an increase of 51,084, or 233 per cent, over the preceding year's sales of the models previously offered. Graham-Paige sales in 1928, it is stated in the letter accompanying the report, represent the greatest first year's total in dollar volume of any new line of cars in automobile history.

The report shows that $5,800,038.89 was invested in plant improvement and expansion during the year, and that factory floor space was more than doubled, now totaling 2,017,430 sq. ft.

The company has filed with the New York Stock Exchange a notice of intention to increase its authorized common stock from 2,000,000 to 2,500,000 shares. The stock has no par value.

Roosevelt Prices Announced

INDIANAPOLIS, April 1—In addition to the Roosevelt five-passenger sedan, previously announced in *Automotive Industries*, which is listed at $995, the Marmon Motor Car Co. announces the prices of three models as follows: Coupe, 2-4 pass., $995; Victoria Coupe, 4-pass., $1,065; Collapsible Coupe, 2-4 pass., $1,095.

Penna. Tax Passes House

HARRISBURG, PA., April 2—The House today passed the Sterling Bill increasing the gasoline tax from three to four cents for one year beginning July 1, 1929. The bill now goes to the Senate and probably will be reported out of committee next week and given a place on the calendar. Its passage is considered certain.

Modine Mfg. Expands

RACINE, WIS., April 3—The Modine Mfg. Co., of this city, maker of radiators and cooling systems for automotive, farm, industrial and oil engine equipment, has purchased a three-story shop building of the former American Seating Co. group in Racine, and will convert it into a plant addition.

Financial Notes

American Chain Co., Inc., with subsidiaries, reports net income of $410,842 for 1928 after all charges, which is equal to $3.80 a share earned on 107,970 shares of seven per cent preferred stock. This compares with a net income of $2,022,811 in 1927, equal after payment of one quarterly dividend on outstanding old stock and seven months' dividend on the seven per cent new preferred stock, to $5.10 a share on 250,033 shares of no par common stock.

Franklin Automobile Co. has declared the regular quarterly dividend of $1.75 a share on its preferred stock and 50 cents a share on the common. The preferred dividend is payable May 1 to shareholders of record April 20. The common dividend is payable April 20 to shareholders of record April 10.

Gillette Rubber Co., Eau Claire, is increasing its capital stock from $1,290,000 to $3,000,000 to make provision for increased business. Plant additions are being completed which make possible an output of 10,000 casings daily. Part of the issue also is to be used to retire the preferred stock.

Hayes Body Corp. reports net profit for 1928 of $884,529 after all charges. This is equivalent after preferred dividends to $3.35 a share on common stock outstanding at the end of the year and compares with net profit of $91,985, or 21 cents a share, on outstanding stock at the end of 1927.

Stewart-Warner Speedometer Corp. has authorized the issuance of 2,000,000 shares of $10 par value common stock to replace 600,000 shares of no par value. Directors of the company were reelected and the name of the corporation was changed to the Stewart-Warner Corp.

Fisk Rubber Co. stockholders have authorized to increase common stock from 1,250,000 to 2,000,000 shares. Present stockholders will be given the right to subscribe to an additional 851,306 shares at $11 a share on the basis of one new share for each share held.

Gardner Motor Co., Inc., reports current assets as of December 31 of $1,694,951 against current liabilities of $57,911. These compare with current assets of $1,377,902 and current liabilities of $286,351 as of the same date in 1927.

Durant Motors of Canada, Ltd., reports net profit for 1928 of $525,954 after all charges. This is equivalent to $1.85 a share on its $10 par capital stock and compares with earnings for 1927 equivalent to $1.25 a share.

Pyrene Mfg. Co. reports net profit for 1928 after all charges of $218,527. This is equivalent to 99 cents a share on its outstanding $10 par value stock and compares with profit of $191,539, or 87 cents a share, in 1927.

Michigan Steel Corp. has declared its regular quarterly dividend of 62½ cents, payable April 20 to stock of record April 1.

Spicer Mfg. Corp. has declared an extra preferred stock dividend of 75 cents payable April 5.

Buick Promotes Six Veteran Employees

Changes in High Posts Follow Resignations of Four Officials

DETROIT, April 1 — The Buick Motor Co., Flint, has announced the promotion of six veteran employees to positions of high executive rank and the retirement of four prominent officials. The six promoted and their new offices are: Robert T. Longway, comptroller; H. G. Mengel, assistant comptroller; K. J. McDonald, assistant treasurer; Clyde F. Waite, assistant treasurer; Loren G. Kurtz, general superintendent, and Lester M. Taylor, superintendent of final car assembly.

The four officials who have resigned and the offices they held are: Harvey J. Mallery, vice-president and comptroller; I. G. Foulk, assistant treasurer; C. J. Ross, general superintendent, and W. J. Browne, assistant general superintendent.

Mr. Mallery, who is succeeded as comptroller by Mr. Longway, became comptroller of the Weston-Mott Co. in 1907 and held that position until the company was absorbed by Buick. In 1916 he organized the Buick personal service department and managed it for more than a year, after which he became managing secretary of the Flint Manufacturers' Association. He returned to Buick as special auditor in 1920 and the following year was made comptroller. He was elected a vice-president in 1920.

For many years Mr. Longway was divisional comptroller of the company. He has been one of the prime movers in the Industrial Mutual Association, a social and benefit organization of Flint factory workers. Mr. Foulk, the retiring assistant treasurer, came to Buick in 1919 from the E. I. duPont de Nemours organization. Mr. Waite, his successor, joined the company in 1900 and soon became paymaster of Factory No. 1. He was chosen general auditor in 1924. He is president of the Industrial Mutual Association.

Mr. Mengel, assistant comptroller, joined Buick in 1914 as traveling auditor for the branch house accounting division. Later he came into the home office and was given the title of assistant treasurer, which he held until his present promotion. His successor as assistant treasurer, Mr. McDonald, joined the company in 1925 as auditor in branch house accounting and later assumed supervision of that work. His new duties bring the billing and factory accounting departments under his charge.

The resignation of Mr. Ross as general superintendent and the appointment of Mr. Kurtz as his successor was announced in *Automotive Industries* several weeks ago. Mr. Taylor, who succeeds Mr. Kurtz as superintendent of the final car assembly, is a former executive of the Dort Motor Car Co. He joined Buick six years ago. Mr. Browne, retiring assistant general superintendent, began his connection with Buick in 1919.

Business Men Favor Travel by Airplane

CHICAGO, April 1—In reply to a recent inquiry conducted by the Boeing System among 1400 business men, only 26 said they were not interested in the airplane for travel. Asked if they would use the airplane for an emergency trip, the men answered as follows: Yes, 1152; No, 43; probably, 8; if not too costly, 3; if necessary, 2; don't know, 23.

Added Stutz Facilities Permit Price Reduction

INDIANAPOLIS, April 1—In commenting on the recent revision of prices on the complete line of Blackhawk cars, Col. E. S. Gorrell, president of the Stutz Motor Car Co. of America, Inc., said, "This reduction is made possible through increased facilities for production and by an increased demand for this car. With our production and sales records as a barometer, we are confident that this will be the greatest year in Stutz and Blackhawk history."

The revisions which list the six and eight-cylinder Blackhawk cars at the same prices follow:

	NEW PRICE	OLD PRICE Six	Eight
5-pass. Sedan	$2,395	$2,695	$2,645
5-pass. Coupe	2,395	2,395	2,345
2-pass. Coupe	2,495	2,595	2,545
2-pass. Speedster	2,535	2,535	2,485
4-pass. Speedster	2,535	2,635	2,585
4-pass. Speedster with tonneau cowl	2,735	2,885	2,835
Cabriolet Coupe	2,595	2,595	2,545
5-pass. Weymann Chantilly	2,595	2,895	2,845
5-pass. Weymann Monaco	2,655	2,955	2,905
4-pass. Weymann Deauville	2,655	2,955	2,905

Curtiss Buys 136 Engines

NEW YORK, April 3—An order for 136 Curtiss Challenger engines has been received by the Curtiss Flying Service, Inc., according to L. B. Cooper, in charge of motor and plane sales for the Curtiss corporation. Sixty of the new engines will go to the Travel Air Co. of Wichita, Kan., and 76 will be received by Command-Aire, Inc., of Little Rock, Ark.

Gear Manufacturers to Meet

The annual meeting of the American Gear Manufacturers' Association will be held May 16, 17 and 18 in the Hotel Statler, Cleveland, Ohio.

Spicer to Commence Building New Unit

Toledo Plant, Costing $255,000, Will Double Facilities in that City

TOLEDO, April 3—The Spicer Mfg. Corp. will start immediately on construction of a new $255,000 unit to its Toledo plant, practically doubling the size of the plant here. The present plant is about a year old. It has been making Houdaille shock absorbers for Ford under contract and it is anticipated that a large part of the Spicer propeller shaft and universal joint business will be concentrated at the Toledo plant.

Manufacturing headquarters were moved here recently. A. Bentley & Sons Co. have the contract for the addition. The plant when completed will cover an area of 600 by 800 ft. R. E. Carpenter, vice-president and general manager, is in charge in this city.

Highway Education Board Holding Safety Contest

NEW YORK, April 2—The Eighth Annual Safety Contest sponsored by the Highway Education Board, Washington, D. C., offers a trip to Washington, with all expenses paid, to the elementary school pupil who writes the best essay on the subject, "My Duty as a Junior Citizen to Observe Traffic Rules."

To the elementary school teacher who presents the best lesson around the subject, "Training Future Citizens in Street and Highway Safety," a check for $500 and a trip to Washington will be presented. In the pupils' contest, 442 medals and a like number of cash prizes are offered as state awards.

Allis Automatic Expanding

MILWAUKEE, April 2—The Allis Automatic Screw Products Co., of this city, has begun construction of a manufacturing addition, 40 by 110 ft. The concern's business is largely in the automotive industries and additional capacity has been greatly needed for several months because of the large volume of demand.

Lamont to Open Convention

NEW YORK, April 2—Secretary of Commerce Robert P. Lamont will make his first public address since assuming office when he opens the 10th National Foreign Trade Convention which is to be held in Baltimore April 17-19. He will speak on "World Trade, Today and Tomorrow."

Lathe Works Resigns

DETROIT, April 1—The South Bend Lathe Works, of South Bend, Ind., has resigned its manufacturer membership in the National Standard Parts Association.

Exports, Imports and Reimports of the Automotive Industry for February of Current Year, and Total for Two Months Ending February

	Month of February				Two months ending February			
	1928		1929		1928		1929	
	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles, parts and accessories	...	$34,944,902	...	$59,559,574	...	$65,991,674	...	$105,395,797
Electric trucks and passenger cars	2	3,245	3	2,444	29	45,884	9	11,990
Motor trucks and buses except electric (total)	8,836	6,360,523	19,805	11,150,108	20,420	13,982,589	32,839	19,114,639
Up to one ton inclusive	6,959	3,598,911	15,699	6,763,318	16,770	8,562,580	25,268	10,806,568
Over 1 and up to 2½ tons	1,654	2,201,011	3,824	3,648,644	3,179	3,981,173	7,010	6,825,025
Over 2½ tons	223	560,601	282	738,146	471	1,438,836	561	1,483,046
PASSENGER CARS								
Passenger cars except electric (total)	25,114	18,822,209	35,253	23,841,334	45,590	34,495,987	59,884	41,712,639
Low price range $1,000 inclusive	19,002	10,608,787	23,848	12,248,050	34,734	19,417,091	41,511	21,401,043
Medium price range $1,000 up to $2,000	5,241	6,014,092	10,285	9,030,680	9,136	10,626,758	16,439	15,841,659
High price range over $2,000	871	2,199,328	1,120	2,562,604	1,720	4,452,138	1,934	4,469,937
PARTS, ETC.								
Parts, except engines and tires	...	...	...	...	...	...	...	...
Automobile unit assemblies	...	4,220,435	...	12,065,224	...	6,861,847	...	23,782,010
Automobile parts for replacement (n. e. s.)	...	3,925,935	...	10,185,989	...	7,563,039	...	16,803,276
Automobile accessories	...	660,616	...	1,015,998	...	1,345,426	...	1,794,545
Automobile service appliances (n. e. s.)	...	637,384	...	584,602	...	996,707	...	1,094,108
Trailers	24	11,393	78	27,490	79	31,788	156	79,841
Airplanes, seaplanes and other aircraft	5	56,970	11	122,473	37	367,722	31	416,865
Parts of airplanes, except engines and tires	...	...	...	...	...	...	...	...
BICYCLES, ETC.								
Bicycles	388	10,742	457	11,272	1,097	29,453	996	26,027
Motorcycles	1,452	315,929	1,514	352,072	2,934	680,301	3,227	741,718
Parts and accessories, except tires	...	127,315	...	130,016	...	234,828	...	213,069
INTERNAL COMBUSTION ENGINES Stationary and Portable								
Diesel and Semi-Diesel	45	43,744	149	81,886	83	138,540	247	176,241
Other stationary and portable:								
Not over 10 H.P.	2,550	199,998	3,013	274,246	5,928	473,666	5,758	503,988
Over 10 H. P.	344	82,875	415	139,826	448	156,027	702	363,188
Automobile engines for:								
Motor trucks and buses	1,210	99,298	984	158,525	2,097	189,062	2,600	311,956
Passenger cars	7,077	852,641	10,175	1,079,978	12,738	1,507,840	16,521	1,784,536
Tractors	40	9,044	132	45,599	102	30,755	175	65,685
Aircraft	10	35,996	23	116,694	14	40,121	56	277,897
Accessories and parts (carburetors)	...	210,185	...	381,728	...	465,694	...	673,804
IMPORTS								
Automobiles and chassis (dutiable)	25	102,861	28	63,437	54	164,066	85	172,748
Other vehicles and parts for them (dutiable)	...	45,779	...	49,644	...	63,640	...	209,784
REIMPORTS								
Automobiles (free from duty)	19	25,742	20	27,148	47	53,304	45	84,084

Firm Seeks Plant Site

LINCOLN, ILL., April 1—The Herman Motor Corp., a $100,000 organization, is negotiating for location of a factory here for production of a new five-cylinder stationary airplane engine, perfected by John F. Herman, engineer. The engine is said to develop 285 hp., features of its construction being its light weight, 50 per cent under the average of its type with fewer working parts. Col. C. W. Wolpert, representing the company, has conferred with local men on the factory plant, which will be designed for production of 50 engines a day, requiring a force of 1500 men.

Building Lumber Plant

OSHAWA, ONT., March 30—A large lumber mill is being erected at Hansard Lake, B. C., by Gill and Crick, Ltd., of this city, to cut lumber for use exclusively in the automobile products of General Motors Co. of Canada, Ltd., Oshawa and Walkerville, Ont. Gill and Crick, Ltd., has the contract to supply lumber for General Motors cars made in Canada.

Wilson Foundry Active

DETROIT, March 30 — Wilson Foundry & Machine Co. announces that production for January, February and March has been 50 per cent greater than ever before. The plant is now producing 2100 engines a day, and night production is being stepped up so that by April 15 the company will be making 2400 engines daily, according to D. R. Wilson, vice-president and general manager of the company.

Light Jubilee Planned

NEW YORK, April 1—The international celebration of the Golden Jubilee of Light, marking the 50th anniversary of the invention of incandescent light bulb by Thomas Edison, will be opened in Atlantic City on the night of May 31. Mr. Edison will address electric light and power industry leaders and it is expected that Henry Ford also will speak. The committee in charge of the celebration is headed by Mayor Ruffu, of Atlantic City, honorary chairman; H. Bradford Richmond, chairman of the executive committee, and Ezra C. Bell, chairman of the promotion committee.

Brazil Sales Slow

WASHINGTON, April 4—Automotive sales are slow in Brazil although some makes are doing well since the arrival of new models, says a report from Rio de Janeiro received this week by the Department of Commerce. Sales of trucks and accessories also were reported as dull.

Warner Has Publication

DETROIT, April 2—The service parts division of the Warner Gear Co., Muncie, Ind., has introduced a new publication known as the "Warner Gearette."

Oakland Announces Plan to Guarantee Used Cars

DETROIT, April 6—The Oakland Motor Car Co. today announced a national policy under which all Oakland-Pontiac dealers will be asked to furnish a written guarantee with all reconditioned used cars. Under terms of this plan defective parts are to be furnished within 30 days after the sale and during the first 750 miles of driving.

M. L. Buck, manager of the used car department of the company, explained that the object of the plan is to provide the purchaser with concrete evidence of the good faith of the dealer who makes the sales.

Featured on the used car guarantee form is a definition of good will as handed down by the United States Supreme Court. This states that "Good will is the disposition of the pleased customer to return to the place where he has been well treated."

Plan Aircraft Show

MONTREAL, April 2—The second annual Aircraft Exhibition at Montreal, Quebec, will be held in the Stadium Building, from May 4 to 11, inclusive, under the auspices of the Montreal Light Aeroplane Club, Inc., of which A. Sydney Dawes is president. Adelstan Levesque, who has been responsible for numerous Montreal Motor Shows, is the general manager. A show office has been opened in the Mount Royal Hotel, Montreal.

John Storey, on Visit, Urges Manufacturers in U. S. to Use More Australian Car Parts

VANCOUVER, B. C., March 30—"My mission to America is to urge American automobile interests to further develop the policy of continuously increasing the consumption of units manufactured in Australia, such as springs, bumper bars, shock absorbers, batteries, transmission gears, crown wheels and pinions, etc.," said John Storey, president of the Automotive Manufacturers' Association of New South Wales, and councillor of the Chamber of Manufacturers of that state, who arrived here yesterday from Sydney.

Mr. Storey, who is a principal of the firm of Storey Bros., Ltd., Australian automotive accessory manufacturers, plans to make a business tour of this country, lasting two months. He suggests that the volume of automotive parts imports into Australia could be minimized without harming American trade and with distinct benefit to the country's good name.

Asked in what respect American automotive manufacturers could help Australian industry, the visitor said they could do it by incorporating more Australian-made products in the automobiles they sell in Australia. Already, by means of prohibitive duties—in which, Mr. Storey said, Australia is but copying the United States precedent—80 per cent of the bodies and nearly 100 per cent of the tires so used are made in that country.

"Australians are intensely patriotic and they will support the nation which supports them," Mr. Storey said. "If the American motor car manufacturers were to utilize Australian-made parts wherever possible, both for equipment and replacement purposes, it would afford them a tremendous propaganda leverage in retaining the expanding Australian market.

"More than 100 nations are using automobiles at the present time and only seven make them. Australia is not yet one of the seven and her people chafe under the disability. A land without any internal waterways to speak of, we feel that we have even more need for motor transport than other people."

In the first annual report of the Automotive Manufacturers' Association of N.S.W., delivered by Mr. Storey last July, he said that it was generally believed impossible for an independent company to produce an automobile efficiently in Australia, because of the tremendous overhead expense in essential research work and the expenditure involved in developing and changing designs of models. It was emphasized, however, as certain that the Australian-built car would follow the unceasing growth of the manufacture of parts.

Estate of W. L. Velie, Jr., Estimated at $500,000

MOLINE, ILL., April 1—The estate of Willard L. Velie, Jr., who died here on March 20, is estimated at $500,000. Mr. Velie made his will 11 days before he was stricken with heart disease. He established his estate, outside of a direct bequest of his home, furnishings and personal jewelry, which he left his wife, Mrs. Martha V. Velie, in a trust fund, the income of which is to be divided equally among his widow and two daughters. The daughters, upon reaching the age of 21, will receive one-third each of the estate.

Mr. Velie received a third of the estate of his father who died five months ago, which included controlling interest in the Velie Motors Corp. and a large block of Deere & Co. stock.

N. Y. Adopts Gasoline Tax

ALBANY, March 30—The bill providing for a permanent gasoline tax of two cents which yesterday passed the Assembly becomes effective May 1. It is estimated that this bill, previously passed by the Senate, will bring $24,000,000 into the state treasury before the end of the next fiscal year.

Montana Tax in Effect

GREAT FALLS, MONT., April 1—The Governor has approved the act of the 1929 Legislature providing for a gasoline tax of five cents a gallon, to be used in the construction and maintenance of the Federal Aid system of highways. The tax becomes effective today.

Automotive Leaders Will Attend Chamber Meeting

WASHINGTON, D. C., April 1—The seventeenth annual meeting of the Chamber of Commerce of the United States will be held in this city, April 29 to May 3, inclusive. More than 1700 affiliated organizations have been asked to send delegates and several thousand business leaders throughout the country, including many in the automotive fields, have been invited.

The Committee on Immigration will present a business viewpoint of the national origins provision of the Immigration Law. On this committee, which is headed by Karl DeLaittre, president, Bovey-DeLaittre Lumber Co., Minneapolis, are: S. H. Bullard, vice-president, Bullard Machine Tool Works; C. R. Hook, vice-president, American Rolling Mill Co.; H. D. Sharpe, president, Brown & Sharpe Mfg. Co., and W. H. Woodin, president, American Car & Foundry Co.

A report advocating removal of a series of handicaps of American shipping will be presented by the Committee on Transportation and Communication. This committee, which is headed by F. W. Sargent, president, Chicago & North Western Railway, includes: A. W. Robertson, chairman of the board, Westinghouse Electric & Mfg. Co.; A. J. Brosseau, president, Mack Trucks, Inc.; A. L. Humphrey, president, Westinghouse Air Brake Co.

Nebraska Amends Tractor Test Law

LINCOLN, NEB., April 1—By a recent act of the Legislature, the Nebraska tractor law, which makes it compulsory for tractor manufacturers to have new models tested by the Department of Agricultural Engineering of the University of Nebraska before they can be sold in this state, has been amended. The amendment takes account of the fact that during the winter months it is generally impossible to conduct tractor tests. It reads as follows:

"Applications for the test of a tractor shall be made to the testing board of engineers and shall be accompanied by specifications of the tractor required by said board of engineers, and by the fee specified in Section 5535, Compiled Statutes of Nebraska for 1922. If the application with specifications and fee is submitted during December, January, February or at any other time when the test can not be started at once, the State Railway Commission, with the approval of the said board of engineers, may issue a temporary permit for the sale of tractors of the model specified in the application for test, the date on which said temporary permit shall terminate to be fixed by the said board of engineers. All temporary permits shall be conditioned upon such tractor as is covered thereby being tested at the earliest available date, and the tractor company to which a temporary permit has been issued shall submit a tractor for test which conforms to the specifications filed with the application, said tractor to be delivered for test at any time specified by the board of engineers. Upon failure so to do, all such fees deposited by said companies shall be forfeited to the State of Nebraska, and in addition such companies shall be liable to the penalties prescribed by Section 5540, Compiled Statutes of Nebraska for 1922, and shall never thereafter be issued any temporary permit whatever. Provided, however, that all sales of tractors upon which a temporary permit has been issued, shall be made subject to the final official test and approval of the model."

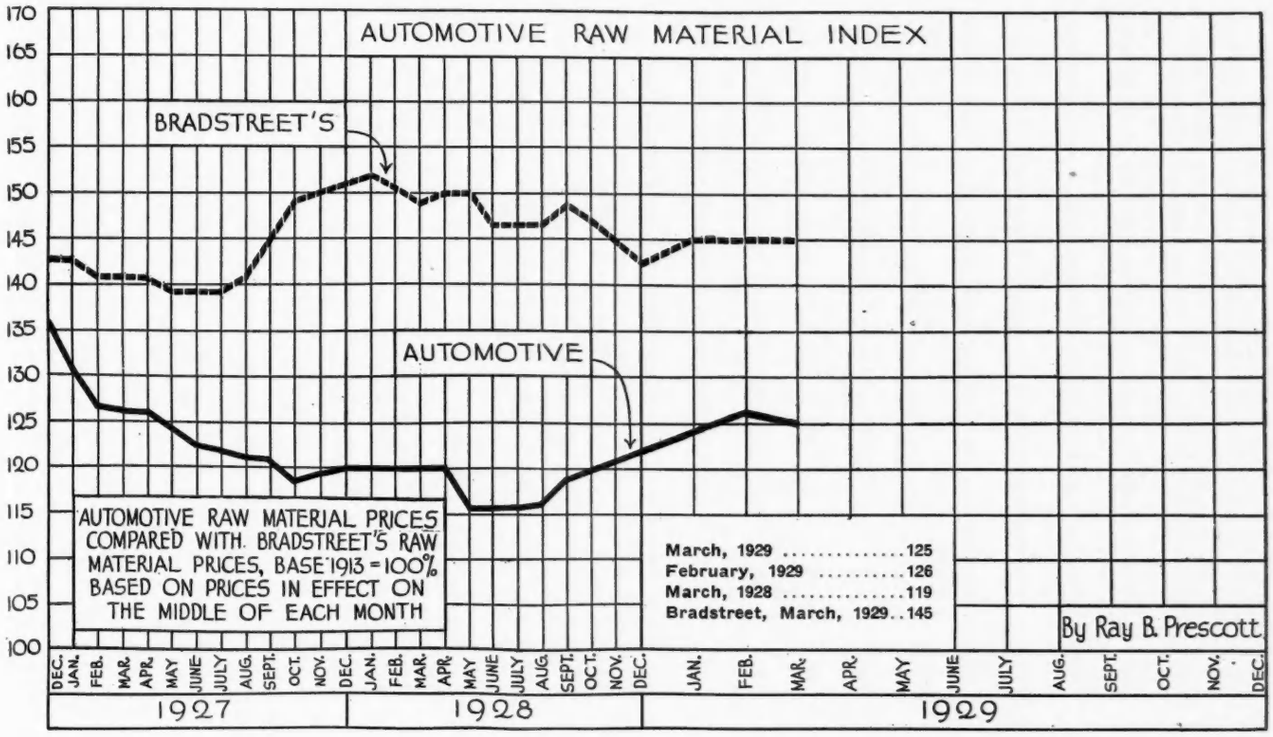
AC Output High

DETROIT, April 1—Sales of the AC Spark Plug Co., Flint, show an increase of 15 per cent for the first quarter, according to H. H. Curtice, vice-president and assistant general manager. Based on present output the company probably will set a new high record during the first six months, he said.

Champion Plants at Peak

DETROIT, March 30—Champion Spark Plug Co. announces that its three plants are working at capacity on the 1929 production schedule which calls for 50,000,000 spark plugs. Production in 1928 was 43,000,000 plugs.

Raw Material Prices Decrease One Point



Ford Producing Model A With Changes in Design

DETROIT, March 30—A number of changes in design have been made in the Ford Model A recently. One of these consists in the use—on a portion of the cars coming through the plant—of an aluminum alloy piston with an invar strut underneath and parallel to the head, which piston was described in a recent issue of *Automotive Industries*. A new steering gear is now fitted, which is better adapted for use with balloon tires. Thrust in the steering gear is taken on two roller bearings at the ends of the worm, and the column is clamped to the bearing adjusting sleeve, which facilitates servicing.

Headlamps are now supplied in two styles, viz.: a two-bulb type for cars without cowl lamps and a single-bulb type for use on cars with cowl lamps. The lamps are provided with 6-8 volt, double-filament, double-contact gas-filled bulbs, the lower filament providing a beam for fast driving while the upper filament illuminates the road close to the car. Focusing is effected by means of a screw at the back of the lamp. A new generator is being installed. It is similar to the one supplied with the Model T but is smaller in diameter and longer than the original Model A generator.

Insurance Firm Organized

PHILADELPHIA, April 1—The Motor Casualty Corp. of America has been organized under the laws of Pennsylvania as the first company to operate exclusively in the writing of non-deductible collision policies. The officers and directors, business men of this city, include: R. G. Erskine, president; E. P. Weber, senior vice-president and secretary; M. E. Bell, second vice-president; Rudolph Bell, treasurer; F. F. Dickerman, chairman of the finance committee; N. B. Fleischer, chairman of the publicity committee; A. B. Lyons, A. R. Keirsey and M. F. Miller.

To Erect Truck Plant

VANCOUVER, B. C., March 30—W. E. Anderson, president of the Hayes-Anderson Motor Co., Ltd., Vancouver, has announced that his company will erect a new factory on a site which it has acquired, in order to consolidate the construction of its trucks under one roof. The company plans to manufacture models ranging in size from 1½ to 10 tons, estimating first year's production at 100 trucks.

Stewart Sales Increase

BUFFALO, March 30—Sales of the Stewart Motor Corp. for the first two months of 1929 shows an increase of 54 per cent over the corresponding period last year, according to T. R. Lippard, president.

Steel & Tubes to Open Plant

DETROIT, April 1—The new $1,000,000 plant of the Steel & Tubes, Inc., Ferndale, will be put into operation in 10 days or two weeks, officials announce. Because of delay in obtaining part of the equipment, the full personnel will not be employed at the start, but within a few weeks 500 men will be at work. Two additional plants are to be built this year.

Chalfant Sees New Mark in Car Parts Industry

DETROIT, April 2—While 1928 was the biggest year in the history of the replacement parts industry, the present business volume indicates that 1929 will exceed last year's record-breaking pace by 25 per cent, according to E. P. Chalfant, executive vice-president of the National Standard Parts Association.

"Parts manufacturers showed an increase in unit sales of 30 per cent in 1928, while parts jobbers showed an increase in dollars and cents sales of 40 per cent," said Mr. Chalfant. "Although net profits registered a substantial gain, the competitive markets and increased overhead costs are making more gross business necessary."

Mr. Chalfant has made arrangements for members of the N.S.P.A. Aeronautical Committee to hold their meetings, April 9 and 10, during the All-American Aircraft Show, in the cabin of a Lockheed-Vega monoplane, cruising over Detroit and environs. The plane is being provided by E. F. Schlee and W. S. Brock, general sales representatives for the Lockheed Co. Mr. Brock probably will act as pilot, it is announced.

Form Philippine Firm

WASHINGTON, April 4—Six motor bus companies in the Philippine Islands have organized the Central Motor Supply Co. at Manila as a holding company with a buying agency to supply their needs for parts and accessories, according to the Department of Commerce.

New Firm to Obtain G. Elias & Bro., Inc.

NEW YORK, April 2—The Elias Aircraft & Mfg. Corp. of Buffalo has been formed for the purpose of acquiring the properties and assets of G. Elias & Bro., Inc., according to A. G. Elias, one of the founders of the business and president of the new corporation. There will be no change in the management of the company. Additional capital will be raised for expanding the airplane branch of the business which has shown steady progress since its beginning eight years ago.

The Elias Aircraft & Mfg. Co. was organized with an authorized capital of 102,000 shares, 2000 of which are preferred shares with $100 par value and 100,000 shares of which are common stock without par value. The preferred shares and 50,000 shares of common stock will be issued to the stockholders, in exchange for all the assets and business of G. Elias & Bro., Inc., whose liabilities are to be assumed. Thirty thousand shares will be offered to the public.

Murray Plans Chain

TRENTON, April 1—The Murray Rubber Co. announces that 1000 chain stores for the selling of tires will be opened throughout the Southern States this year. C. Edward Murray, Jr., president, estimates that the business will be so expanded that it will add more than $1,000,000 to the payroll of the Trenton concern. It was also announced that Caldwell & Company, of Nashville, Tenn.; the National Bank of Kentucky, of Louisville, and the Third National Bank of Scranton, have acquired a substantial interest in the Murray Company.

Hong Kong Favors Right-Hand Drive

WASHINGTON, April 4—American manufacturers are advised to ship to the Colony of Hong Kong, China, only cars with right-hand drive, although the left-hand drive is not absolutely prohibited, says a dispatch received this week by the Department of Commerce. The Hong Kong Government has promulgated a regulation providing that every left-hand drive car must be equipped with a device indicating the direction to be taken by such vehicle, after July, 1929.

Hancock Iron Expanding

DETROIT, March 30—The Hancock Iron Works has purchased from the General Motors Corp. a site in Pontiac for the erection of a new plant to provide 25,000 sq. ft. of floor space.

New Jack Lines Announced

RACINE, WIS., April 1—The Walker Mfg. Co. of this city announces that within a short time shipments will be started on its new 800 Series of hydraulic hand jacks and its new 400 Series of truck and bus jacks.

Woman Rides in Rocket Car

ADENAU, PRUSSIA, April 1—The first woman to ride in a rocket car, Fraulein Waldenfels, of Dusseldorf, traveled at the rate of 80 m.p.h. with Otto Volkart, the builder, here today.

Wallace Aircraft Prepares to Move

ROCKFORD, ILL., April 1—C. E. Thompson, president of the Wallace Aircraft Co., has announced that the company will transfer its activities from Chicago, where it has been operating for the last year, to this city within the next six weeks. The company has purchased a 160-acre tract about five miles from this city for its airport, and has obtained 7½ acres adjacent as a factory site. The main factory will be 220 by 80 ft., with a paint shop 80 by 36 ft. The initial production schedule calls for one plane a day.

The Wallace company, recently organized with $1,000,000 capital, manufactures the Touroplane, a three-passenger craft, with folding wings, powered by a Kinner 110-hp. engine with a cruising speed maximum of 100 m.p.h. and a landing speed of 45 m.p.h. The company will offer $150,000 of its capital stock to local investors, according to officials. J. J. Lake is sales manager; O. W. Ford, vice-president, and Stanley Wallace, engineer. Negotiations are under way for establishment of a Canadian plant, and a sales office has been established at Toronto. The Rockford Electric Co. has offered the aircraft firm a site near Quebec to use as a subsidiary plant.

Welding Pamphlet Out

NEW YORK, April 1—The Air Reduction Sales Co., New York, has published in pamphlet form a paper on "Developments and Progress of Mechanical Gas Welding," which was presented by J. L. Anderson, of its engineering research department, before the International Welding Association some time ago.

Calendar of Coming Events

SHOWS

Nantes, Commercial .....Apr. 4-15
Lille, Commercial .....Apr. 6-21
All-American Aircraft Show, Detroit Board of Commerce, Detroit..Apr. 6-14
Milan, Trucks .....Apr. 12-27
Jugo-Slavia, Automobiles .....Apr. 20-28
Budapest Auto Salon.....May
Melbourne Automobile Show.....May 2-11
International Aircraft Exhibition, Olympia, London .....July 16-27
International Aircraft Exhibit, Coliseum, Chicago .....Sept. 7-15
Paris, Automobiles .....Oct. 3-13
London, Automobiles .....Oct. 17-26
Prague, Automobiles .....Oct. 23-30
Paris, Motorcycles .....Oct. 23-Nov. 3
M.&E.A. Show, Chicago.....Nov. 4-9
N.S.P.A. Show and Convention, Detroit .....Nov. 11-16
Berlin Auto Salon .....Nov. 14
London, Trucks .....Nov. 7-16
Paris, Trucks .....Nov. 14-24
London, Motorcycles .....Nov. 30-Dec. 7
Brussels Auto Salon .....Dec. 7

CONVENTIONS

Annual Meeting National Foreign Trade Council, Baltimore .....April 17-19
Mississippi Valley Mfg. & Wholesalers, St. Louis .....April 17
National Battery Manufacturers Association, Cincinnati .....April 24-26
American Welding Society, Annual Meeting, New York City....April 24-26
National Safety Congress Meeting, Kansas City .....April 30-May 2
American Society of Mechanical Engineers, Detroit .....May 1-3
American Management Association, New York .....May 6-11
National Safety Congress Meeting, Detroit .....May 7-9
National Highway Traffic Association, Hotel Stevens, Chicago.....May 13-15
National Hardware Association (Metal Branch) Annual Meeting, Detroit, May 16-17
American Gear Manufacturers' Association, Annual Meeting, Hotel Statler, Cleveland .....May 16-18
A.S.M.E. Aeronautic Meeting, St. Louis, May 27-30
American Society Testing Materials, Annual Meeting, Atlantic City, June 24-28
A.S.M.E.—Iron and Steel Division—National Meeting, Cleveland...Sept. 11-13
Eastern States Exposition, Springfield, Mass. .....Sept. 15-21
National Machine Tool Builders' Association, Cleveland.....Sept. 30-Oct. 4
National Safety Congress, Annual, Chicago .....Sept. 30-Oct. 4
World Engineering Congress, Tokio, Japan .....Oct. 29-Nov. 30

RACES

Akron .....May 12
Gardner Trophy (Aircraft), St. Louis, May 28-30
Indianapolis .....May 30
Detroit .....June 9
Altoona, Pa. .....June 15
Rudge Whitworth Cup, Le Mans, June 15-16
Salem, N. H. .....June 29
French Grand Prix .....June 30
Akron .....Aug. 18
National Air Races and Show, Cleveland, Aug. 24-Sept. 2
Syracuse .....Aug. 31
Altoona, Pa. .....Sept. 2
Cleveland .....Sept. 15
Salem, N. H. .....Oct. 12

S. A. E.

Aeronautic Meeting, Detroit.....April 9-10
Summer Meeting, Saranac Lake..June 25-28
Aeronautic Meeting, Cleveland..Aug. 26-28
Production Meeting, Cleveland.....Oct. 2-4

Sectional

Detroit .....April 9-10
Canadian ..... " 10
Penna. ..... " 10
So. Calif. ..... " 12
Indiana ..... " 13
New England ..... " 17
Northwest, Portland, Ore..... " 20